

Mali Long Term Training and Capacity Building Needs Assessment

**Africa Agriculture Capacity Development Training Initiative
Strategic Technical Assistance for Results with Training (START)**

Prepared for

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Submitted by

The Academy for Educational Development

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Acronyms

ACAM	:	<i>Chambres d'Agriculture du Mali</i>
AEG	:	Accelerated Economic Growth
ALO	:	Association Liaison Office
APCAM	:	<i>Chambre d'Agriculture du Mali</i>
BIFAD	:	Board for International Food and Agricultural Development
CARI	:	<i>Cellule d'Appui à la Reforme Institutionnelle</i>
CGIAR	:	Consultative Group on International Agricultural Research
CIRAD	:	<i>Centre International pour la Recherche</i>
CORAF	:	<i>Conseil Ouest et Centre Africain pour la Recherche et le Développement Agricole</i>
CPS	:	<i>Cellule de Planification et de Statistiques</i>
CSP	:	Country Strategic Plan
DGRC	:	<i>Direction Générale de la Réglementation et du Contrôle</i>
DNAMR	:	<i>Direction Nationale de l'Appui au Monde Rural</i>
DNCN	:	<i>Direction Nationale de la Conservation de la Nature</i>
ENI	:	<i>Ecole Nationale des Ingénieurs</i>
ENSUP	:	<i>Ecole Normale Supérieure</i>
EU	:	European Union
GDP	:	Gross Domestic Product
HIV	:	Human Immunodeficiency Virus
ICRAF	:	<i>Centre International pour la Recherche en Agro-Foresterie</i>
ICRISAT	:	International Crops Research Institute for Semi-Arid Tropics
IEHA	:	Initiative to End Hunger in Africa
IER	:	<i>Institut d'Economie Rurale</i> (Institute of Rural Economy)
IITA	:	International Institute of Tropical Agriculture
INSAH	:	<i>Institut du Sahel</i>
IPR/IFRA	:	<i>Institut Polytechnique Rural/Institut de Formation et de Recherche Appliquée</i> (Agricultural School at Katibougou)
IRD	:	<i>Institut de Recherche pour le Développement</i>
ISESCO	:	<i>Conseil Islamique pour la Science et l'Education</i>
ISFRA	:	<i>Institut Supérieur de Formation et de Recherche Appliquée</i>
LTT	:	Long Term Training
MAEP	:	<i>Ministère de l'Agriculture, de l'Elevage et de la Pêche</i>
ME	:	<i>Ministère de l'Education</i>
MOE	:	<i>Ministère de l'Environnement</i>
MS	:	Master of Science
MSA	:	<i>Ministère de la Sécurité Alimentaire</i>
NGO	:	Non-Governmental Organization
ON	:	<i>Office du Niger</i>
OPIB	:	<i>Office du Périmètre Irrigué de Baguineda</i>
PASAOP	:	Agricultural Services and Producer Organizations Program
PhD	:	Doctor of Philosophy
PIB	:	<i>Périmètre Irrigué Baguineda</i>
PP	:	<i>Programme Palu</i>

PRSP	:	Poverty Reduction Strategy Program
SOTELMA	:	<i>Société de Télécommunications Malienn</i>
STP/CIGQE	:	<i>Secrétariat Technique Permanent du Cadre Institutionnel de la Gestion des Questions Environnementales</i>
UNDP	:	United Nations Development Program
UNICEF	:	United Nations Children's Fund
U.S.	:	United States of America
USAID	:	United States Agency for International Development
WARDA	:	West Africa Rice Development Association
WB	:	World Bank

Executive Summary

This report was initiated to address both long and short-term training and capacity building needs for the agricultural sector in Mali, with emphasis on long term training (LTT). It provides recommendations for the United States Agency for International Development's (USAID) intervention for the next 10 to 15 years. Over the past decade, Mali has undergone dramatic economic and political reforms, offering new opportunities for agricultural growth and providing a favorable environment for investment. In implementing the U.S. government's new Initiative to End Hunger in Africa (IEHA), Mali has been chosen as one of the first three African countries to meet this objective. One of IEHA's aims is to strengthen agriculture through investment in training. This new look at USAID strategic involvement is timely, because progress at cutting hunger and poverty in Mali, through long-term training slowed down considerably over the past decade. As a result a gap is being created as most of those trained in the 1960s to 1970s have either retired or are nearing the age of retirement, and no plan was put in place for their replacement.

Consequently, this situation calls for an urgent intervention and demands a method of replacement if a gap in technical expertise in Mali is to be avoided in the future. Allowing such a gap to persist will greatly hinder economic growth and development in Mali. Agricultural sector development can only occur when an important number of trained personnel are available to undertake research, address issues affecting the agricultural and rural development sector, provide new and appropriate technologies and break new ground for future economic growth. New and innovative programs must be developed and commitments established to increase the human and institutional capacity of Mali's growing agricultural sector. USAID should thus resume a program in long term training to help produce the next generation of Malian leaders (Abt Associates, 2002; BIFAD, 2003).

The policy environment in Mali has changed dramatically with the central government becoming more diffuse and many more actors (farmer associations, the private sector and non-governmental organizations) getting involved in policy and decision making particularly in the agricultural sector. Global market competition, technological advancement, increased government divestiture and changing production are significantly altering the future of agriculture in Mali. Programs to train Malians in the agricultural sector will be absolutely vital for future guidance and direction of the sector. Such training will provide transitional employment opportunities, increase current skills, provide opportunities for advancement and increase job opportunities within the agricultural and rural development sector by improving efficiency and enhancing production.

To address training needs, a team of consultants completed an agricultural training needs assessment for Mali. A stakeholder workshop was conducted, meetings with selected stakeholders were held and questionnaires were completed by a sample of employees in research, extension and teaching.

Specific disciplinary training pertaining to biotechnology and biodiversity, agricultural trade and agribusiness, management of natural resource and the environmental, irrigation management, food processing, animal health and nutrition, information systems management, geographic information systems and fishery were the most highly requested.

The next most requested training included impact assessment, biometrics, policy analysis, project planning and management, agricultural extension, English language, library science, agro forestry, computer skills and technical writing. Concurrently, capacity building of facilities such as the biotechnology, soil science and livestock laboratories, computers and bibliographic materials for libraries were cited as crucial for efficient delivery and sustainability of training.

Recommendations

Following a series of meetings with key stakeholders in the agricultural sector in Mali, visits to key agricultural installations, the assessment of questionnaires and the outcome of a stakeholder workshop, the following are the recommendations.

1. The United States government should commit resources for LTT in Mali.

The body of researchers and teachers trained in the U.S. in the last four decades is gradually being wiped away as some retire and others are approaching the age of retirement.

- Institutions of higher learning in Mali lack the capacity for graduate level teaching. The first batch of Malians selected for training should therefore take all taught courses in the U.S. or in a university in Africa that offers comparable high quality education but at a lower cost.
- Student's research involving primary data collection should be done in West Africa and research funding for doctoral research in Mali should be part of a PhD training package and research topics should address problems relevant to Mali and/or the sub-region.
- Co-supervision of thesis research should be encouraged with research or advisory committee made up of international university staff and Malian or regional institute's staff.

2. A national selection committee should be appointed by appropriate government officials.

The selection committee will establish selection criteria and will select candidates for long-term training each year.

- One of the conditions for accepting a long-term training opportunity should include an obligation for the recipient to return to service within Mali for at least two years for each level of training supported.
- The committee will collaborate with USAID for student placement for LTT based on quality of education and cost in the U.S., in African countries and other third countries.

3. USAID should establish linkages between a consortium of U.S. universities and private sector organizations with institutions in Mali and the sub region.

Establishing linkages through academic partnerships will help build strong national teaching and research capacities and establish collaborative research linkages.

- USAID should use the association liaison office (ALO) for university cooperation in development, to establish linkages between universities in the U.S. and institutions in Mali.
- The Malian government should commit itself to providing support for establishing linkages between the university and research institutions and regional international research institutes for collaborative thesis supervision.

4. USAID should commit resources for capacity building in Malian agricultural institutes of higher learning and research.

The essence of capacity building is sustainability- the creation of institutions that continue to perform. The failure of government or an agency to budget funds to sustain a project after completion can be taken to mean that the government or agency awards less priority to that project.

- USAID should provide funds to strengthen the capacity of Malian institutions to engage in teaching, research, and extension in agriculture and rural development.
- A percentage of these may be regional in nature.
- Strengthen biotechnology laboratory at the *Institut Polytechnique Rural /Institut de Formation et de Recherche Appliquée* (IPR/IFRA).
- Establish a biotechnology laboratory at the *Institut d'Economie Rurale* (IER).
- Acquire bibliographic materials for library and computer workstations.
- Establish information technology laboratory for faculty/staff development.
- Develop the soil science laboratory at IPR/IFRA.
- Establish a Livestock laboratory at IPR/IFRA.

-
- Provide competitive research grants for returning PhDs.
 - The Malian government should provide continuous counterpart funding for future maintenance of these facilities while a sustainability plan is put in place by the institutions.

5. USAID should support a program in short-term training for Malians in areas critical to agriculture and rural development.

Most Malians, especially in the research institutes, have the basic qualification in some of the fields proposed for training. What is required at this stage is to close the gap between what they know and the technological progress made in their disciplines. The advantage here is that it is cost effective and covers greater numbers in a relatively short time. This training:

- Will serve as refresher courses for those with higher qualifications in the discipline.
- Will serve as an introductory course to policy makers relating to new concepts/disciplines, for example, biosafety.
- Raise awareness of recent developments in a discipline for busy executives and people in the private sector.

6. Funds should be provided to support monetary and non-monetary incentives, including sabbatical leaves for teaching faculty.

It is now widely recognized that the lack of efficient incentive structures in public services is a source of human capacity building weakness and a serious impediment to the effectiveness of capacity building interventions. Sabbatical leaves would allow faculty to learn new research techniques and to generally renew their knowledge and capacities.

- IER and IPR/IFRA should establish a selection criteria and a process for awarding sabbatical leaves. Recipients should be obliged to return home and provide services following completion of the leave.
- Training should be coordinated with personnel and incentive structures, in light of a realistic assessment of labor market conditions.
- In order to be offered advanced training the person should be on a career track that leads to appropriate promotion and improved emoluments following successful completion of the training.

7. A committee of well known and highly respected persons, by virtue of their positions and accomplishments, within Mali should be appointed to review the higher education system and to recommend a higher education system that best meets the needs of the country.

- The current system appears to be in transition and does not appear to reflect a clear vision for what best serves the needs of Malians.
- This national committee should include some representatives from the university system.

1. Introduction

This report provides an assessment of long-term training (LTT) and capacity building needs for Mali's agricultural sector based on recommendations from a stakeholder workshop, results of interviews with personnel of universities and the research and extension institutions, and personal discussions with key stakeholders in both the public and private sectors.

This human capital and institutional assessment is based largely on the concerns raised by the Board for International Food and Agricultural Development (BIFAD) over the decline in USAID's support for LTT and its impact on developing countries. Moreover, most of those trained in the 1960s and 1970s have either retired or are nearing the age of retirement while no replacement plan was put in place after their training. This situation demands an aggressive approach to replacement if a gap in technical expertise in the Mali is to be closed.

To translate these concerns into deed, a team of consultants completed an agricultural training and capacity building needs assessment for Mali, one of the three initial countries chosen as target for the U.S. Initiative to End Hunger in Africa. Essentially, three technical tasks were accomplished to document the needs for training and capacity building:

- A stakeholder workshop was conducted to determine agricultural training and capacity needs for Mali. These included representatives from government ministries, the private sector, universities, research institutes and farmer associations. A steering committee was appointed to discuss and prioritize identified needs.
- A number of meetings were held with selected stakeholders to discuss their roles and contributions to agricultural development in Mali.
- Questionnaires were completed by a sample of employees in research, extension and teaching.
- An inventory of public and private sector, including donors' contributions to training and capacity building in Mali was taken.
- A series of visits were made to key agricultural installations including plant and animal protection laboratories, animal nutrition laboratory, irrigation installations, Biotechnology laboratory, the University of Bamako and the faculty of agriculture.

These efforts resulted in training and capacity building recommendations envisaged to increase the skills of Malians, enable them to move to a higher level in their occupation and assist them to contribute in all facets of agricultural development in Mali.

2. Background

Mali is a landlocked country in West Africa and one of the poorest in the world (Bingen, Robinson and Staatz, 2000). It has a population of 11 million with a land area of 1.24 million square kilometers. Mali is currently undergoing a dramatic economic reform, which has begun yielding results in terms of improved economic growth. Being an agrarian economy, small-scale farming dominates the agricultural sector, with agriculture accounting for 46 percent (\$1.4 billion) of total GDP, growing at a steady rate of 4.8 percent per annum between 1991 and 2000 (USAID/Mali, 2003).

Mali's success in achieving adequate economic growth, reducing hunger and eliminating poverty over the last decade provides a strong imperative for Mali and its developing partners to forge a new development strategy. The dramatic political and economic restructuring over the past decade has caused many changes in Mali, offering new opportunities for agricultural growth and providing a favorable environment for investment. The political context in Mali is much more favorable today arising from a marked change from a dictatorial military regime to a successful form of democracy.

Mali is more firmly committed to reducing poverty and hunger now than at any other time in the past. Malian leaders, the public and private sector organizations, and citizens are beginning to take their places as the central actors in the fight against hunger and poverty which falls within the basic objective of the initiative to end hunger in Africa (IEHA). Key to meeting the objectives of IEHA in Mali is the education and training of Malians, who will become U.S. colleagues and future trading partners (BIFAD, 2003).

Following the decline in U.S. funding for long term training, the current set of Malian professionals with higher-level quality education constitute either the retired or those nearing the age of retirement within the current decade (Figure 1). The majority of the new generation of professionals only hold a Bac+5, equivalent to a B.S. degree. The lack of qualified staff in both the public and private sectors in Mali is impeding development in the agricultural sector and general economic growth of the country. Educational institutions in Mali lack the human resources to institute graduate level training in agriculture, which calls for USAID's intervention to provide long term training. Universities in the U.S. have the comparative advantage in providing quality education for Malians that will foster a viable agricultural sector. With U.S.-Mali scientific cooperation and education exchange, new technologies and genetic resources will advance agriculture in Mali.

The following sections will provide an overview of Mali's agriculture in the context of poverty reduction. This will be followed by a description of the education, research and extension systems in Mali, the Government Ministries directly involved in agriculture and donor interventions in agriculture. The final section will provide the methodology for this work and a prioritization of areas identified as needs for training

and capacity development, linkages between the identified needs and USAID/Mali mission strategic objectives and possible areas for future collaborative tranig.

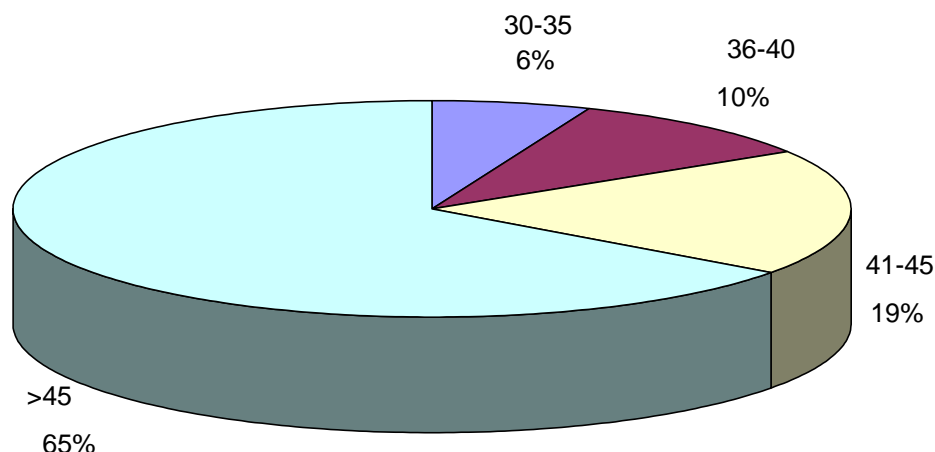


Figure 1: Age distribution of Malian Agricultural Professionals

Source: survey data, 2003

3. Mali's Agriculture and Poverty Reduction Strategy

The Malian government's Poverty Reduction Strategy Program (PRSP) was adopted in May 2002 and finalized in August 2002. The PRSP may be seen as a summary of the government's initiatives and priorities for agricultural growth and rural development towards the reduction of poverty. It constitutes the referential document for sectorial policy elaboration and implementation. The PRSP expresses the will of the government of Mali to engage in a more intensive, organized, consensus based, and efficient development action capable of reducing poverty in a sustainable way. In real terms the Malian government has set a general objective of reducing poverty to an incidence of 47.5 percent in 2006, a reduction of one third of the current poverty incidence (63.8 percent).

The PRSP is articulated around three priority areas:

- 1) Institutional development and improved participation in governance
- 2) Human development and reinforced access to basic social services
- 3) Development of infrastructures and support to productive sectors

The PRSP accentuates the significance of a range of activities in areas of interest within the context of IEHA goals and objectives. It focuses on government concerns in the following areas relevant to the IEHA themes: agricultural research, rural water management, promotion of marketing and processing, support for producer organizations, support for private sector development and vulnerable populations.

Specifically, the government of Mali aims at reinforcing the engine of economic growth through rural sector development by achieving the following objectives:

- Enhance food security.
- Develop rural infrastructures.
- Provide support for the development, processing and marketing of key agricultural products (dried cereals, rice, fruits, vegetables, cotton).
- Promote the development of sea products.
- Contribute to agro-industrial promotion.
- Add value to livestock related products.
- Add value to fisheries related products.
- Contribute to job creation in rural areas.

Government Training Intervention and Institutional Reform

Training

Currently, there is no structured national training plan to clearly indicate training strategies for Malians in general or for the staff of Mali's agricultural institutions. Strategic plans for training are formulated by each institution based on independent needs, though they are carved within the national capacity building objective. Some institutions such as IER and IPR/IFRA have drawn up their strategic plans for training based on training needs while plans for training in some other institutions are supply driven and in most cases are either not available or outdated.

The Ministry of Agriculture, Livestock and Fisheries is in the process of elaborating a long term strategic training plan that will extend up to 2020. This plan is still being developed and it is proposed to be discussed in 2004.

Training has historically been implemented simultaneously at local, regional, and international levels. Local and regional training in most cases are funded directly by the institutions concerned or from government funds through the Ministry of Education. Almost all technical diploma and bachelors level training are done locally and for agriculture in particular at IPR/IFRA.

Graduate training is done out of the country. International training has historically been supply driven as influenced by the source of funding, accessibility of the training institutions, the area of specialization stated by the funding agency, and an agreement of training cooperation between external donors and the Malian government. For external training involving government agreements with funding

agencies, candidates are nominated by their respective institutions. A committee set up by the government approves them for funding and for the specialized fields for which funding has been announced or allocated by the funding agency. In situations of direct partnership between institutions in Mali and external institutions, candidates are nominated directly by their institutions without government involvement. In such situations training in specialized fields of study are determined at institutional levels within national government policy framework. International training offers the opportunity of language and computer training in addition to exchange of cultures and experiences.

As a policy, all Malians sent to another country for training secure their positions while out of the country. Upon their return they are reinstated at a level commensurate with the level of training they have acquired within an established national employment code.

Institutional reform

The government of Mali has set up a ministry under the supervision of the Prime Minister's office in charge of public sector reforms and management of institutions in order to coherently implement government reform policies. Rapid institutional changes are taking place targeted at achieving the following objectives:

- Disengage the state from economic operator's function in favour of the private sector ;
- Reinforce state capacity in fulfilling its mission of international relations, security, human rights, policy orientation and regulation of strategic choices;
- Sustain technical services in mastering their functions;
- Reinforce the capacity of economic actors.

Reforms in agriculture, food security, environment and education are in progress. Institutions covered in this report are facing new challenges of decentralisation, management reforms within the poverty reduction framework, sustainable development through new knowledge in areas like information technology, biotechnology and globalisation. These institutions need to play new roles, take new responsibilities, and fulfil new tasks to meet those challenges. Training will play a tremendous role in this direction.

4. Current Institutional and Human Capital Development

Education system

Knowledgeable and well-trained people and effective institutions are critical for achieving agricultural growth. Institutions of higher learning will need to manage public policy to support agriculture and rural development, attract and mobilize investments, provide technical services to the agricultural sector, and play the key role of providing access to agricultural training and education. Effective institutions will also require an adequate supply of trained people and the right infrastructure. Investment in human and institutional capital development is critical to achieving the government of Mali's objectives of sustained agricultural and economic growth and food security.

Several training institutions are involved in the agricultural sector in Mali, ranging from public primary formal and informal education to tertiary education plus some private technical level training institutions. For degree level training in agriculture two main institutions are involved which are discussed below:

Institut Polytechnique Rural de Formation et de Recherche Appliquée (IPR/IFRA)

IPR/IFRA started as an Agronomic Research Station in 1897 and has played a critical role in the country in training the bulk of middle level Malian agriculturists and extension personnel. The faculty contributes to regional development by providing training in agriculture and rural development for personnel from West and Central Africa. The *IPR/IFRA* program in agriculture specifies training courses offered for agriculture targeting mainly production. *IPR/IFRA* offers four-year courses, an equivalent Bachelor of Science level degree leading to a *Diploma of Agricultural Engineer* in agronomy (*Diplôme d'ingénieur agronome -DIA*), animal husbandry, hydrology, forestry and agricultural engineering in addition to a two year (BAC+2) technical level training in several discipline of agriculture leading to the award of a diploma (*Diplôme universitaire de technologie -DUT*). *IPR/IFRA* also carries out agricultural research under the auspices of the Ministry of Education and currently houses a biotechnological laboratory for potato research.

The institute is being restructured and a proposal has been prepared to commence training at the M.S. level (Maîtrise) and subsequently PhD level (Doctorat). The program is yet at the formative stage since the school lacks the required staff and relies heavily on part-time personnel from the private sector and the agricultural research institute. This proposal can only be translated into accomplishment if the level of training of current faculty is upgraded and/or a new set of personnel receives higher-level long-term training.

From the survey, 90% percent of the staff of *IPR/IFRA* have at least a Masters degree. Of this number 80% are above the age of 45 and received their graduate level

training in the 1980s. What this means is that in the next 5-10 years some of the staff will have retired or be close to the age of retirement. Moreover 65% of staff have degrees in traditional agricultural disciplines like agronomy, animal science, crop protection etc. while just a handful have qualifications in more specific fields like natural resources management, project planning, biotechnology, agro-business etc. It is against this background that the institute has launched a restructuring program to focus on more specific fields of specialization in order to be able to continue providing the skills needed in Mali's agricultural sector. While an elaboration of the training needs of the institute is presented in table 22 the institute has ranked as its priority in the immediate future, the following fields of specialization presented in table 1.

Table 1: Prioritized Training needs of the *Institut Polytechnique Rural de Formation et de Recherche Appliquée*

Discipline	No. of qualified staff	Staff needing training	Remarks/Results
Biotechnology	3	7	Specialization at the MS and PhD levels; Research & Professorial track
Biodiversity	3	6	Specialization at the MS and PhD levels; Research & Professorial track
Agricultural trade and agribusiness	5	4	Specialization at the MS and PhD levels; Research & Professorial track
Agricultural Policy analysis	0	5	Specialization at the MS and PhD levels; Research & Professorial track
Food Processing	2	4	Specialization at the MS and PhD levels; Research & Professorial track
Animal Nutrition	0	3	Specialization at the MS and PhD levels; Research & Professorial track
Management of natural resources and the environment	3	2	Specialization at the MS level; Research & Professorial track.
Irrigation technology	3	1	Specialization at and PhD level; Research & Professorial track
Information technology	2	3	Specialization at the MS level; Research & Professorial track.
Geographic information systems	0	3	Specialization at the MS level; Research & Professorial track.
Biometrics	1	5	Specialization at the MS and PhD levels; Research & Professorial track
Agronomy	30	2	Specialization at the PhD level; Research & Professorial track.
Library science	0	2	Specialization at the MS level. Librarian.

Linkage between IPR/IFRA, US Universities and other Institutions

IPR/IFRA is currently linked with Michigan State University (MSU). MSU is instrumental in establishing new training programs and continues to provide funds for staff visits. MSU signed a five year agreement with the University of Mali on September 29th, 2000. The specific activities of the agreement are: to hold continuous consultations with colleges, centers, faculties, departments and colleagues for potential mutual benefit in applied research; encourage units within both universities to explore realizable activities such as student and faculty exchange for initiation of research and the organization of conferences and seminars that will be of benefit to both institutions; work towards formalizing the pursuit of cooperative activities at the level of faculty and fields of specialization, and to search for external funding of projects that provide mutual benefits. To date only staff exchange visits has taken place.

In addition to the agreement with MSU, IPR/IFRA receives direct support from other donors, NGO's and universities. Support varies from training, technical assistance to infrastructure assistance. Table 2 presents IPR/IFRA partners while table 3 presents staff in training and location of training.

Table 2: Partners of the *Institut Polytechnique Rural de Formation et de Recherche Appliquée*

Donors	NGO	Research	University
Netherlands	SG 2000	IER	MSU , USA
World Bank		LCV	ENESAD, France
USA(ALO)		IRD	Institut Agr. Lareinsten, Netherlands
EEC		ICRISAT	Université de Turin , Italy
Soc. Intern		ICRAF	CNEARC , France
UNESCO		CIRAD	

Table 3: Ongoing Training of Staff of the *Institut Polytechnique Rural de Formation et de Recherche Appliquée*

No. of Persons in Training	Location
1	Russia
2	France
2	Mali
1	Belgium
2	USA
1	Netherlands
1	Canada
1	Czechoslovakia

Institut Supérieur de Formation et de Recherche Appliquée (ISFRA)

ISFRA is a training institution which addresses a range of topics from elements of agricultural production to and including change in production. It is the recognized and sole institute mentoring students for PhD research in agriculture. Training at this level has been demand driven and has focused on staff availability at the institute in the discipline for which training is needed. To be able to provide Malians with training in emerging fields in agriculture, a new set of Malians should be trained in areas that the institute lacks but are in high demand now and will continue to be in the near future. All of the staff at this institute hold a PhD, however the institute is heavily understaffed and relies on a pool of Malian professionals drawn from the private sector and research institutes. The school contributes to teaching and research at IPR/IFRA.

The Government Ministries and Associated Institutions

Agriculture is the largest industry in Mali producing rice, millet, sorghum, maize, groundnuts, cotton, cattle, sheep and goat. The Malian Government through its Ministries of Agriculture and Rural Development, Food Security, and the Environment is shifting towards improving natural resource management practices and small-scale irrigation for major productivity improvements. The major route to achieving this objective is through agricultural research and extension. Agricultural research generates new technologies that increase agricultural productivity which has an impact on the gross domestic product (GNP). To obtain the benefits from research, policies must be in place that enable the link between research gains, productivity increases and the resulting food security, nutritional improvement and poverty reduction. The ministries and associated institutions however lack the technical expertise to carryout effective research and extension activities, and develop and carry through good policies. Training of Malians therefore to fill this gap is crucial. Improving access to improved science and technology to boost agricultural productivity will be in harmony with the themes of IEHA. Several institutions are involved in agriculture operations under the mandates of the Ministries Agriculture, Livestock and Fisheries, Ministry of Food Security and Ministry of Rural Development. Key to the development of agriculture in Mali are the following institutions;

Institut d'Economie Rurale (IER)

The economic return to public agricultural research investments in Mali is promising. The application of research on crop genetics to improve drought tolerance, utilization of plant nutrients, food nutrient content, and pest and disease resistance has, in the past, produced favorable returns to investment in Mali. Sustained growth in productivity will depend upon continued improvements in crop germplasm and

improved nutritional value of staple foods such as rice, maize and sorghum, as well as crops and livestock nutrition and health. Some of the most promising gains in this area may come from new biotechnology research for a rain-fed farming system such as Mali's.

IER is the lead Malian national agricultural research systems (NARS) agency, under the Ministry of Agriculture, Livestock and Fisheries. It is headquartered in Bamako, with six field stations at Kayes, Sotuba, Sikasso, Niono, Mpoti and Gao. Since its inception IER has carried out national public good research on a wide range of agricultural and rural development issues, cutting across crops and livestock production, forestry and fishery, natural resources management and food science and animal nutrition. In order to be effective, IER sets priorities and works in partnership with many other institutions locally and internationally in the field of agriculture, rural development and natural resource management.

The institute has undertaken a fundamental review of its agricultural programming both to reflect the change impacting the agricultural industry and to ensure the continued relevance of IER's agricultural strategies. This long term strategy will build on its accumulated knowledge, experience, and collaborative relationships. In response to stakeholder demand, donor concerns and the changing agricultural policy environment, IER's key research themes have evolved and at present:

- Attention is shifting from production to a broader notion of genetic improvement including biotechnology and biodiversity
- Researchers are giving increased attention to the need for sustainable management of the natural resource base upon which food and agriculture depends.

Although IER has a good number of well trained personnel, most of these people will retire within the next decade. From the survey, only 35% percent of the staff of IER hold a PhD degree, the remaining 65% are holders of either an MS or Bachelors degree. Over 75% of PhD holders are serving as departmental directors and have been in research for over 25 years. Over 60% of holders of both the PhD and MS level degrees are above age 45. What these results indicate is that IER requires both an upgrading of staff and staff replacement to be able to undertake competitive research.

IER for instance has recently completed a workshop on the feasibility of biotechnology research in Mali. However the institute currently lacks the manpower to carryout this function though it has qualified staff in similar disciplines like breeding. What most of the staff require is an upgrading of their current capacities and a breakthrough into newer areas of specialization in agriculture. In this direction the institute has put together a strategic plan of research involving a restructuring of agricultural research in Mali. A component of this strategy is an aggressive approach to training. Table 4 therefore presents the prioritized training needs of the *Institut d'Economie Rurale*.

Table 4: Prioritized Training needs of the *Institut d'Economie Rurale*

Discipline	No. of qualified staff	Staff needing training	Remarks/Results
Biotechnology	n.a.	21	Specialization at the MS and PhD levels. Researcher; may teach when required.
Biodiversity	n.a	4	Specialization at the MS and PhD levels. Researcher; may teach when required
Agricultural Economics	n.a	5	Specialization at the MS and PhD levels. Researcher; may teach when required
Agricultural Policy analysis	n.a	2	Specialization at the MS and PhD levels. Researcher; may teach when required
Food Processing	n.a	2	Specialization at the MS and PhD levels. Researcher; may teach when required
Animal Nutrition	n.a	3	Specialization at the MS and PhD levels. Researcher; may teach when required
Management of natural resources and the environment	n.a	3	Specialization at the MS and PhD levels. Researcher; may teach when required
Irrigation technology	n.a	5	Specialization at the MS and PhD levels. Researcher; may teach when required
Information technology	n.a	1	Specialization at the MS level
Geographic Info. systems	n.a	1	Specialization at the MS level
Biometrics	n.a	3	Specialization at the PhD level. Researcher; may teach when required
Agronomy	n.a	9	Specialization at the PhD level. Researcher; may teach when required
Bioengineering	n.a	1	Specialization at the PhD levels. Researcher; may teach when required

n.a = data not available

Linkage Between IER, US Universities and Other Institutions

IER is collaborating with Purdue University on a carbon sequestration project. The Carbon from Communities project presents a unique opportunity to simultaneously address agricultural productivity, natural resource conservation and carbon sequestration in Mali; a country experiencing periodic droughts and rapid natural resource degradation. The collaborative project will involve the Sustainable Agriculture and Natural Resources Management (SANREM) and Soils Management (SM) Collaborative Research Support Programs (CRSPs). Data will be used to

provide an efficient and rapid means to inferentially assess carbon stock changes attributable to community-based agriculture and natural resource management (NRM) decisions.

In addition to the collaborative research with Purdue University, IER is a recipient of direct support from other donors, NGO's and universities. Support varies from training, technical assistance to infrastructure assistance. Table 5 presents IPR/IFRA partners while table 6 presents staff in training and the location of their training.

Table 5: Partners of the *Institut d'Economie Rurale*

Donors	NGO	Research	University
Netherlands	SG 2000	INSA	MSU , USA
World Bank	Chemonics International	WARDA	PURDUE University, USA
USAID	Winrock Itn.	IRD	Montpellier, France
European Union		ICRISAT	
Canada		ICRAF	
France		CIRAD	
Belgium		CORAF	
Switzerland			

Table 6: Ongoing Training of staff of the *Institut d'Economie Rurale*

No. of Persons in Training	Location
3	Senegal
1	France
1	Mali
2	USA
2	Netherlands

Direction Nationale de l'Appui au Monde Rural (DNAMR)

The national extension system in Mali resides largely at DNAMR. Non-governmental organizations also play a role. For an increase in agricultural output the extension system needs to be well-organized and equipped. The staff of DNAMR is ill-equipped and most of them are nearing the age of retirement. From the survey, 60% of staff holds a Bachelors degree while about 20% of the staff are technicians with about 2 years of university training.

Since the training by USAID/AFGRAD in the 1990s, no other long-term training of staff has taken place. With support from the World Bank, the government aims to

increase the effective extension system through the newly created Agricultural Services and Producer Organizations Project (PASAOP).

While reaching out to farmers is important, the staff of DNAMR need to be able to adequately interpret and apply government policies and to carry out on-farm research. Recently, DNAMR was mandated to identify National Seed Service agricultural producer associations best suited to multiply seeds. However, due to under-funding of this institution and inadequately qualified staff, the system seemed unable to take up the challenge (USAID/Mali, 2003). As Mali goes through its institutional restructuring it is important that staff who are mandated to carry out research results to farmers be adequately trained for the task. Table 7 therefore presents the training priorities of DNAMR .

Table 7: Prioritized Training needs of the *Direction Nationale de l'Appui au Monde Rural*

Discipline	No. of qualified staff	Staff needing training	Remarks/Results
Geographic Info. Systems (GIS)	2	6	Specialization at the MS level. Senior Extension officers
Fish farming	2	8	Specialization at the MS level. Senior Extension officers
Fish transform. and conservation	0	4	Specialization at the MS level. Senior Extension officers
Irrigation technology	5	15	Specialization at the BS and MS level. Senior Extension officers
Extension animation & communication	0	10	Specialization at the BS and MS level. Senior Extension officers
Policy analysis	0	10	Specialization at the BS and MS level. Senior Extension officers
Animal nutrition	0	10	Specialization at the MS level. Senior Extension officers.
Aquatic fauna	2	12	Specialization at the MS level. Senior Extension officers
Project monitoring and evaluation	2	12	Specialization at the MS level. Senior Extension officers
Economic analysis/ Econometrics	2	12	Specialization at the MS level. Senior Extension officers
Human resource management	0	3	Specialization at the MS level. Senior Extension officers
Defence and soil restoration	2	12	Specialization at the MS level. Senior Extension officers
Library sciences	2	12	Specialization at the MS level. Senior Extension officers

DNAMR's most active partners are projects operating in the country that provide extension contracts for the institute. Table 8 presents donors who have in some way funded DNARM while table 9 presents training of staff mainly in the region.

Table 8: Partners of the *Direction Nationale de l'Appui au Monde Rural*

Donors	NGO	Research	University
Netherlands	More than 250 contract clients	IER	IPR/IFRA, Mali
World Bank			
Arab Funds			

Table 9: Ongoing Training of staff of the *Direction Nationale de l'Appui au Monde Rural*

No. of Persons in Training	Location
A total of 29 people are in training in all the institutions listed	IPR/IFRA, Mali
	ENI, Mali
	ENSUP, Mali
	AGRHYMET , Niger
	Japan

National Central Veterinary Laboratory

The National Central Veterinary Laboratory is the second research institute of the Ministry of Agriculture, Livestock and Fisheries. It deals with vaccine production, the diagnosis of human and animal diseases. It does research on animal nutrition and animal diseases and participates in the master's level training of Malian and other African technical staff. Built in early 1970 with support from USAID, it produces vaccines that are sold in Mali and in other African countries such as Burkina Faso, Mauritania, Guinea, Togo and Angola. Currently the institute is almost self-sustaining, covering 80% of its running cost. The majority of staff at this institute were trained in the U.S.

Direction Générale de la Réglementation et du Contrôle (DGRC)

DGRC is responsible for legislation and regulation in fields of pastoral resources, river resources, animal health, quality control of agricultural products, plant pathology protection, foodstuffs quality control, quality control of veterinarian and agro-pharmaceutical products, animal semen and vegetable seed, and livestock professionals. This institution is envisioned to become important as Mali implements

biotechnology food production techniques. It is thus of significance if training is provided for the staff in readiness to face this challenge. Table 10 provides the prioritized training needs, followed by collaborating partners in table 11 and staff currently undergoing training is presented in table 12.

Table 10: Prioritized Training needs of the *Direction Générale de la Réglementation et du Contrôle*

Discipline	No. of qualified staff	Staff needing training	Remarks/Results
Epidemiology (animal diseases)	1	10	Specialization at the MS level. Professional staff of the directorate.
Health legislation	0	10	Specialization at the MS level. Professional staff of the directorate.
Hygiene (food products)	1	15	Specialization at the MS level. Professional staff of the directorate.
Quality control food products	1	15	Specialization at the MS level. Professional staff of the directorate.

Table 11: Partners of the *Direction Générale de la Réglementation et du Contrôle*

Donors	NGO	Research	University
Service de Coopération et d'Action Culturelle (SCAC) Ambassade de France	Handicap International IFDC IIED	IER LCV	none
USAID			
World Bank (PASAOP)			
PACRT (Programme d'Appui aux Communes Rurales de Tombouctou)			
ADNord (Agence de Développement du Nord Mali)			

Table 12: Ongoing Training of staff of the *Direction Générale de la Réglementation et du Contrôle*

No. of Persons in Training	Location
4	Niger
11	Mali

Direction Nationale de la Conservation de la Nature (DNCN)

DNCN is responsible for national natural resource management, formulation of environment and natural resource policy, especially national forestry management. It provides support to communities and the private sector in their own forestry management, by participating in the training and education of people regarding environmental protection and management. Mali faces severe exposure to soil degradation and requires good water management in production since it is a country prone to drought. Training staff of DNCN to be able to deliver good natural resources management messages to farmers and Malian population is of utmost importance. This institute is heavily understaffed with only 20% of staff having graduate level training in related fields.

Table 13: Prioritized Training needs of the *Direction Nationale de la Conservation de la Nature*

Discipline	No. of qualified staff	Staff needing training	Results/Remarks
Natural resource management	6	57	Specialization at the MS level. Professional staff of the directorate.
Project planning, monitoring and evaluation	13	70	Specialization at the MS level. Professional staff of the directorate.
Economics	0	10	Specialization at the MS level. Professional staff of the directorate.
Statistics	1	15	Specialization at the MS level. Professional staff of the directorate.
Geographic Info. systems	0	15	Specialization at the MS level. Professional staff of the directorate.
Communication techniques	1	22	Specialization at the MS level. Professional staff of the directorate.
Genetic approach	2	70	Specialization at the MS level. Professional staff of the directorate.
CES/DRS	3	60	Specialization at the MS level. Professional staff of the directorate.
Human resources management	0	20	Specialization at the MS level. Professional staff of the directorate.
Legislation and Norms	2	20	Specialization at the MS level. Professional staff of the directorate.

Table 14: Partners of the *Direction Nationale de la Conservation de la Nature*

Donors	NGO	Research	University
none	none	none	none

Table 15: Ongoing Training of staff of the *Direction Nationale de la Conservation de la Nature*

No. of Persons in Training	Location
15	IPR/IFRA
4	Europe

Secrétariat Technique Permanent du Cadre Institutionnel de la Gestion des Questions Environnementales (STP/CIGQE)

Due to the importance of environmental problems and the transversal aspect of the mandate assigned to the Ministry of the Environment, the government of Mali set up an institutional framework of environmental management by a decree dated Dec 24, 1998. A Permanent Technical Secretariat was established to promote, monitor and evaluate national environmental programs related to territory management, natural resources management, water management, improving landscape, and the development of new and renewable energies. It also has the mandate to carry out environmental impact assessments and evaluation procedures.

The heavy load of this institution requires an urgent training intervention. It is one of the main institutions with greater government concern for the protection of the environment because of its cross-cutting role with other ministries. This secretariat however lacks the staff to successfully implement its mandate. In the light of the above, table 16 presents the prioritized training needs. The benefit of training to this institution will go a long way in achieving Mali's agricultural strategic plan.

Table 16: Prioritized Training needs of the *Secrétariat Technique Permanent du Cadre Institutionnel de la Gestion des Questions Environnementales*

Discipline	No. of qualified staff	Staff needing training	Results/Remarks
Mgt of Natural Resources and Environment	n.a.	2	Specialization at the MS level. Professional staff of the directorate.
Geographic Info. Systems (GIS)	n.a.	3	Specialization at the MS level. Professional staff of the directorate.
Agricultural Economics (incl. Agribusiness + Trade)	n.a.	1	Specialization at the MS level. Professional staff of the directorate.
Extension, Animation Communication	n.a.	2	Specialization at the MS level. Professional staff of the directorate.
Economic Analysis/ Econometrics	n.a.	1	Specialization at the MS level. Professional staff of the directorate.
Defence and soil restoration	n.a.	1	Specialization at the MS level. Professional staff of the directorate.

n.a = not available

Table 17: Partners of the *Secrétariat Technique Permanent du Cadre Institutionnel de la Gestion des Questions Environnementales*

Donors	NGO	Research	University
GTZ	none	none	none
UNDP			

Table 18: On-going Training of staff of the *Secrétariat Technique Permanent du Cadre Institutionnel de la Gestion des Questions Environnementales*

No. of Persons in Training	Location
1	Delta C (Bamako)

Secteur Privé (Chambre d'Agriculture du Mali- APCAM)

New partnerships of the public/private sector are evolving in response to the optimistic investment climate in the agricultural sector in Mali. Notable among these is the sugar and hides/tanning industries. U.S. private investment is being proposed in joint partnership with the Malian government for the development of sugar production and processing capacity and marketing (USAID/Mali ,2003). In addition,

private U.S. interest has prompted the proposed construction of a livestock hide tanning factory in the country. The tannery has begun construction implementation and has a certain market identified for the forthcoming production. The sugar facility on the other hand is in the preliminary planning and investment identification stages. Private sector participation in other agricultural products is still limited probably due to the limited markets for such products and undeveloped processing facilities.

With the on-going divestiture policy, Mali needs a new wave of managers to take over the divest public sector institutions. Moreover, anticipating increased agricultural productivity, Mali will require trained personnel in the banking sector to provide for the growing demand in banking services, micro credit experts to be able to organize grassroots micro credit and trade specialists to forecast demand and supply situation of commodities both locally and internationally. Table 19 presents the prioritized needs for training.

Table 19: Priority Training needs of the *Secteur Privé-APCAM*

Discipline	No. of qualified staff	Staff needing training	Result/Remarks
Agribusiness and trade	0	5	Specialization at the MS level. Private sector Professionals.
Labor Economics	2	7	Specialization at the MS level. Private sector Professionals
Management	0	10	Specialization at the MS level. Private sector Professionals
Project monitoring and evaluation	3	15	Specialization at the MS level. Private sector Professionals

Table 20: Partners of the *Secteur Privé-APCAM*

Donors	NGO	Research	University
World Bank (PASAOP)	Répertoire d'ONG Prestation dans différents domaines	IER	IPR/IFRA
USAID		LCV	
		INSAH	

Table 21: Ongoing Training of staff of the *Secteur Privé-APCAM*

No. of Persons in Training	Location
2	IPR/IFRA

Donor Interventions¹

Mali receives assistance from external donors. The major bilateral donors are France, the European Union, the United States of America, Germany, the Netherlands, Japan, and Canada, while the major international agencies include the World Bank, the United Nations Development Program (UNDP), the African Development Bank, United Nations International Children's Emergency Fund (UNICEF) and the Arab Bank for African Economic Development.

France is the largest bi-lateral donor and provides about 30% of Mali's bilateral aid. The French are providing considerable assistance to institutions working in agriculture. Their program covers rural development, environment, mining, energy, transport, private sector development, health, education, and the financial sector. They also assist the chamber of agriculture, agricultural unions and other agricultural associations. They provide training, and technical assistance in many areas related to rural development. For example they provide policy analysis and technical assistance to the Directorate of Planning and Statistics of the Ministry of Rural Development (MDR). They are also providing education and research support to IER.

Germany is the second largest donor to Mali at present. Its program covers rural development, environment, mining, energy, transport, private sector development, health, education, and the financial sector. GTZ implements the German Ministry of Foreign Cooperation's aid program. GTZ provides leadership in donor coordination on the implementation of the National Environmental Action Plan while maintaining its long-running investment in anti-desertification programs, integrated pest management, and approaches to desert locust control. It provides senior advisors to the Ministry of Equipment, Territorial Infrastructure, Environment, and Urban Development, the Ministry of Health, and the Ministry of Finance. Along with the German Credit fund (KfW), GTZ supports infrastructure development, irrigation rehabilitation, energy development, and transportation. It is an active participant in the development of microfinance institutions. German aid also supports communication programs and post -conflict reconciliation and development programs in Northern Mali

The Netherlands provides direct budgetary assistance to the government of Mali in addition to support for rural development, education, health, and the environment. They are involved in the National Rural Infrastructure Program (PNIR) and the Agricultural Services and Producer Organizations Program (PASOAP). They have funded irrigation schemes and small rice introductions. The Dutch are also providing support to agricultural research (IER) and the Chamber of Agriculture and support to micro finance. They are interested in improving donor coordination and have found good donor coordination in the *Office du Niger*.

¹ This section is culled from 'Mali Agricultural Sector Assessment': Agricultural Policy Development Project, vol. 2: In-depth analysis and Supporting Materials, pg 10-14. Abt Associates Inc.; March, 2002.

The European Union has in the past worked on the major development sectors in Mali. It was active in the *Office du Niger*, cotton, livestock, environment, and small scale irrigation. In the future the EU intends to focus less on projects and more on programs. For the next five years the resources will be diverted to transportation and decentralization. They are also interested in better donor coordination but believe it must be led by the Malian government.

Canada is the sixth largest donor in the country. They are providing assistance in education, health, economic growth, governance, and basic program support. In economic growth, they have allocated significant resources to agriculture and micro finance. Much of their work is in Dire, North of the Segou region, and is focused on increasing wheat production and providing a means of generating off farm income, especially for women.

The World Bank's current program focuses on producer organizations, rural infrastructure, and agro-processing. Their major current project is PASAOP whose purpose is to alleviate poverty in Mali through sustained labor productivity increases brought about by technical change in agricultural and non- agricultural rural productive activities (World Bank 2001). The project is divided into 3 phases. Phase 1 involves a national strategic action plan for rural education and training and for rural information and communication as well as support to the national AIDS prevention program (PNLS) in rural areas. Phase 2 involves decentralization of research and extension funding so that local communes can choose the research and extension they want and the vendor of the services. Phase 3 shall integrate the national agricultural knowledge system and ensure its technical and financial sustainability. The World Bank is also involved in irrigation, small roads and potable water and support to agro-processing aimed at improving quality of agro-processed products to meet the quality standards of the international market.

The African Development Bank's current agricultural development strategy focuses on improved access to markets and agro-industry. AfDB avoids a leadership role in initiatives which already have effective leadership from other agencies or donors. It however supports other donor initiatives. AfDB's support to Mali includes projects relating to irrigation, production of certified seeds, livestock development, as well as the Structural Adjustment Program (SAP). For the next decade more emphasis will be put on post harvest needs and focus on improving farmers access to markets and providing support to member countries in identifying critical points for intervention throughout the production process.

5. Purpose, Strategies and Priority Setting

Purpose and Strategy

The purpose of this report is to provide Mali with the required human capital and institutional capacity needs for increased growth in agriculture and rural development. The purpose is based on USAID's Initiative to End hunger in Africa (IEHA). To ensure success, the development strategy to support agriculture and rural development will reflect a dynamic plan, implemented through long-term graduate degree training and capacity building of Mali's research, extension and higher education institutions in agriculture and rural development.

Methodology and Priority Setting

In view of the diverse causes and consequences of the persistent problems encountered in developing Mali's agricultural base and its food security, USAID must craft its assistance for long term training and capacity development in a broadly defined agenda while at the same time setting priorities as constrained by resources. In order to accomplish this objective, a design team of four (two from the U.S. and 2 from Mali) with support from USAID carried out assessment exercises for a three-week period. The team presented their scope of work to the USAID/Mali mission and received the input and support. With guidance from the national consultants, several meetings were held with key stakeholders including the Ministries of Agriculture Livestock and Fisheries, Environment, Food Security, and Education, the Chamber of Agriculture, the agricultural research institutes, the University of Bamako, the Rural Polytechnic Institute and the private sector involved in agriculture. Additional field visits were made to key agricultural installations including the biotechnology laboratory at IFPRA, the Livestock site at Sotuba, the irrigation systems at *l'Office du Périmètre Irrigué de Baguineda* and the veterinary central laboratory.

During the course of these visits a stakeholder workshop was held to determine long-term training and capacity building needs.

The Stakeholder Workshop

The workshop was official opened by the Secretary to the cabinet in the Ministry of Agriculture, Livestock and Fisheries and presentations were made by representatives from the Ministry of Education and the Deputy Director of the USAID mission in Mali. After presentation of the purpose of the workshop by the consultants, the workshop participants, representing major stakeholders in Mali's agriculture sector, were divided into four groups based on area of professional specialization to come up with national training needs and associated levels of training, modes of delivery and

duration of training. Each group appointed a chairman and secretary who formed the stakeholder committee that was responsible for prioritizing the needs identified by each group and discussed in the plenary session.

Results of stakeholder meetings

Appendix 3 provides a list of the sectors involved in agriculture that attended the stakeholder meeting. After the official openings and presentation of the work at hand, representatives were divided into four groups based on disciplines, namely training, research, extension and the private sector.

The following were the tasks to be accomplished by each group:

- Discuss the background, rational and objectives of long term training needs and capacity building for Mali.
- Identify training and capacity building needs relating to agriculture and rural development for Malian higher education, research and extension institutions, including government and the private sector.
- Prioritize the identified training (by degree and areas of specialization) and capacity needs (institutional strengthening) and targets (level of training, disciplines, numbers, duration and types of activities to be supported).
- Determine methods (models) of delivering long term training to Malians e.g. in the United States, in Mali, in other African countries: ‘sandwich’ programs, summer institutes, exchange programs, institutional twinning, distance education, etc.
- Determine private sector involvement in training and capacity building through grants, scholarships, equipments etc.
- Suggest method (s) of selection of trainees e.g. through a government institution, a multi institutional committee, etc.

The following were the group findings:

Group I: Research

Identifying training needs

On the question of identifying training needs for agricultural researcher, the following areas were identified : management of natural resources, microbiology, ecology and biodiversity, biochemistry, animal reproduction, environmental science, economic

analysis, economic policy, rural economics, biometrics, virology, forestry, zoology, food technology, agricultural research management, agronomy, agricultural mechanization and post harvest, molecular biology in-vitro culture , genetic improvement, site management (landscape architecture), animal and plant biotechnology, human resources management, enterprise management and administration, management of information systems, project planning and management, financial auditing.

The issue of prioritization of training was left with the steering committee members to liaise with each affected institution to prioritize the needs.

Mode of delivering training

With regard to the mode delivering the training, the research team noted that there could be several methods. All levels of researchers legitimately aspire to acquire more knowledge in their fields of specialization and are thus eager to gain training when the chance or opportunity exists. It is within the research policy for all senior staff to undergo further long term training or frequent short term training to upgrade their skills.

Group 1 suggested ‘sandwich’ programs for training in which trainees do all of their course work and laboratory training in universities overseas and research in Mali or in another African country with similar environments and socio-economic conditions. Alternatively, researchers can undergo training in renowned universities in Africa in partnership with regionally renowned research institutions (national and international).

It was noted that there is very little private sector involvement in training. If any it is possibly paying for their staff to improve skills at the research institution or university. Some of local support is however provided for short term training in terms of logistics.

Selection Method

The group suggested the formation of a national selection committee to study the conditions of training and thereafter be charged with the selection of trainees. The committee would be comprised of researchers and staff of other state-controlled structures with backgrounds in research. This group would assist the government to reinforce the already crafted policies of creating incentives for trainees’ return and retention by securing a position upon return to the institution with the commensurate salary, promotion based on the educational level attained, an established structure of promotion based on performance, and the opportunity for sabbatical leave.

The following should be considered in the selection of candidates:

Age: Privilege should be given to young professionals who have the scope of providing longer service to the institution. A maximum age of 40 years should be considered for researchers wanting to pursue a PhD from the bachelor's degree level and 45 for those already with a master's degree but wanting to upgrade to a PhD.

Prioritized discipline: Priority should be given to disciplines that are revolving and new but are lacking in the institution e.g. biotechnology, geographic information systems, molecular biology, biodiversity, agro-business, information technology, and biological engineering.

Gender: Female candidates should be encouraged while maintaining the same age and discipline criteria. The number of female candidates is too low in the institution and thus needs to be addressed.

People to be trained should also include those moving to higher levels i.e. MS to PhD, those actively engaged in projects whose output can be increased through higher training, newly employed research assistants who have the zeal and desire to continue in research or may want to venture into new but similar fields of study, e.g. a plant breeder wanting to venture into plant biotechnology or a cartographer wanting to go into GIS. For effective resource management it would also be necessary to provide training for research support which includes senior staff in administration vice personnel, accountants, logistics officers and laboratory technicians.

Group 2: Extension

Identifying training needs

On the question of identifying training needs for agricultural extension, the following areas were identified: agribusiness, GIS, animal nutrition, irrigation systems management, management of natural resources and the environment, bio security, human resources management, management of information systems, post harvest technology and food processing.

Mode of delivering training

With regard to the mode of delivering the training, the extension team suggested full time training in Mali or a renowned African institution. They emphasized professional exchanges between Malians engaged in agricultural extension and international research institutes (CGIARs) or university extension systems. Also they felt that the training of Malians in the form of short term attachments to recognized institutions (Universities and CGIARs) should be explored.

Selection Method

They suggested a national selection committee /team of recognized professionals from government ministry, research & extension and non-governmental organizations.

The group emphasized that a new generation of extension staff should be trained to replace the old ones since most of the current staff are nearing the age of retirement and training or employment of new staff has not occurred over a long period of time. They suggested that for ease of work, training should be provided for public and private sector extension officers including officers of production, processing and marketing or distribution organizations.

For retention of graduates or their return home after international graduate study, the group suggested that the following conditions be put in place:

- Networking with institutions and professionals abroad.
- A research package upon completion of degree and access to competitive research packages.
- Institution of sabbatical leave.
- Annual and adequate increase in salaries commensurate with level of training attained.
- Institutions support for the search for collaborative research grants.

Group 3: Training/Education

This group was comprised of training officers in research, extension and representatives from the agricultural university.

Identifying training needs

On the question of identifying training needs for the Malian agricultural sector the following areas were identified: animal and plant biotechnology, international trade, agricultural marketing and agribusiness management, human resource management, forestry, natural resources and the environmental management, ecology, biodiversity and bio-security, biochemistry, microbiology, animal reproduction, economic analysis, economic policy, rural economics, management of agricultural research systems, project planning and management, food processing and post harvest technology, biometrics, virology, zoology, agronomy, post harvest, molecular biology in-vitro culture, genetic improvement, site management (landscape architecture), enterprise management and administration, management of information systems, accounting and auditing.

Mode of delivering training

With regard to the mode of delivering the training, the group noted there could be several modes of training which include ‘sandwich’ programs, training full time in Mali in the future (if the agricultural institute is upgraded to provide higher level training to an MS and PhD), and regional training based on cost and quality. The team however emphasized that currently, priority should be given to ‘sandwich’ training where trainees spend a year or two in a renowned institution for teaching and their research period in Mali or across the region with Mali included if regional research is to be undertaken.

Selection Method

Selection of candidates should also be considered at two levels. Initial selection should be done at institutional levels based on the training needs. Each institution should set up a neutral body with the training officer as secretary to the body for the selection of candidates. The list of selected candidates would then be presented to a national committee for final selection. The national committee would be comprised of experienced, recognized and highly-respected citizens. The committee should include a member with technical expertise in agriculture and another member with experience in training.

The group also suggested that in selecting who to train, emphasis should be put on the replacement of those that have retired and have not been replaced due to the lack of expertise in Mali and those nearing retirement. The second group should be the young who want to venture into relatively new fields of study such as biotechnology, information systems management, agribusiness, food technology, etc. The third group should be those with an MS who want to be upgraded to a PhD but are below the age of 45 years and whose disciplines are prioritized in the strategic development of agriculture in Mali.

As an incentive structure for graduates to return home and to continue their profession in agriculture, the group suggested that the Malian government should have as a strategy the following:

1. Assurance of a leave of absence with pay when on study
2. Assurance of promotion beyond the position before training within a specified period of time upon return home
3. Institution of sabbatical leave in each institution.
4. Facility to go on leave of absence without pay for a specified period on contract to another institution and to be reinstated after the contract.

Group 4: Private Sector

Identifying training needs

The following areas were identified as training needs for the private sector: food and consumer science which should include food storage, processing, packaging and marketing and agribusiness management.

Mode of delivering training

The group noted that since there is presently no institution in Mali offering the identified training needs, trainees will require full time training in the US or a third country. The group also noted that distance learning could be used if offered affordably.

Selection Method

The group suggested the formation of a national selection committee made up of respected and high caliber personnel from both the public and private sectors with final selection to be made by an international committee.

The group observed that the only reliable mode of retention of workers was to provide competitive salaries and institute career development paths through promotions based on performance.

The Steering Committee

Each of the four groups (Research, Training/Education, Extension and Private Sector) formed during the stakeholder workshop appointed a chairman and secretary who formed the stakeholder committee that was responsible for prioritizing the needs identified by each group.

The steering committee met with key institutions involved in agriculture and were recognized during the stakeholder meeting to discuss the list of training needs identified by the respective groups. The steering committee met the following week with the consultants to discuss the training needs during which the national consultants provided direction to the discussions. These meetings resulted in the prioritized needs as presented in tables 1-21 while the general needs which were abridged from a longer list for both long and short term training are presented in tables 22 and 23.

Long Term Training Areas of Priority

The priority areas discussed below are of fundamental importance to the present and future developmental requirements of Mali. At present, the institutions in Mali do not have staff with the appropriate qualifications to meet the challenges of these disciplines. Some institutions do have staff with qualifications in fields similar to the identified areas and thus require a switch to these new areas to specialize. However some of those with these similar qualifications are nearing retirement and thus the

payoff in retraining would be quite limited. As recommended by the stakeholder plenary and sustained by the committee it is imperative to identify a new cadre of Malians with a career track interest in agriculture in addition to those experienced staff already in employment but with at least ten more years of career service to be offered training opportunities in these identified disciplines.

A process of long term training with a built-in sustainability component is therefore required to be instituted if Mali's agricultural growth is to be accelerated to meet both local and global challenges. Staff of the institutions could undergo graduate training in U.S. universities or renowned regional institutions to be able to carry out viable research upon their return to Mali and for university staff to be able to teach and gradually introduce graduate level training at IPR/IFRA. Introducing graduate level training in agriculture at IPR/IFRA will provide an insurance policy and cushion the shock when donor funding is withdrawn and will continue into the future to provide training for Malians and other citizens in the region.

Within the national policy objectives of the agricultural sector the following areas of specialization were identified, resulting from the stakeholder workshop, steering committee meetings and the responses to the questionnaires.

Plant and animal Biotechnology

Amongst other science based agricultural technology, biotechnology holds the potential to help Mali achieve higher yields, improve pest control, greater drought resistance, reduced dependence on chemical fertilizers, shorter growing seasons, and increased nutritional value of crops. The judicious deployment of biotechnology and other improved technologies could lead to an agricultural revolution in Mali. It is important also to adequately protect plant germplasm while at the same time focusing enough on the preservation of non-indigenous species.

A new strategy will need to address present obstacles to the application of biotechnology including concerns related to the potential impact on health and the environment. Though Mali stands to gain from this technological advance, its laboratory is rudimentary and lacks national professionals to undertake comprehensive research into this field.

The small laboratory at IPR/IFRA is currently being managed by a single foreign staff under a contract that will expire by the end of 2003. If biotechnology research is to be sustained in Mali the need for long term training and equipping the laboratory cannot be overemphasized. There is need for training staff at IPR/IFRA with specializations in related fields like breeding to be able to continue the biotechnology program already begun. Moreover, as IER has laid the foundation through public workshops, to commence research in biotechnology it is necessary to train staff to meet this challenge.

In anticipation of an increased role in biotechnology, short term workshops, seminars and training programs are recommended to raise public awareness of the technology, put in place laws relating to the use of the technology, and implement policies regarding biosafety.

Biotechnology was ranked on the top of the list of priority from the consultations of the steering committee. In addition, 83% of researchers who responded to the questionnaire stated that biotechnology is the most needed area of specialization now in Mali. Demand for the training is high among researchers as 92% of them expressed interest in undergoing long term training in biotechnology while 100% percent of the respondents in research, teaching and extension expressed interest in short term training in biotechnology in the form of workshops or seminars.

Agribusiness and Trade

Efficiency gains in agribusiness and trade can translate into increasing rural incomes for small-scale farmers who produce the food basket of Mali. It is important to note that the market reforms so far enacted have been necessary but not sufficient to generate greater agricultural production and competitiveness in export markets. The weakness of Malian market is partly a problem of a poor communication system or market information, but problems with quality standards, timing, market information, and assured supplies also penalize local products in both domestic and international markets. These constraints provide a rich and legitimate agenda for the public sector to address.

Given its natural comparative advantage, Mali's export of livestock, skins, hides, fish, groundnuts and sheanuts continues to increase. Mali should, with the right mix of domestic reforms and institutional and infrastructure investments be able to claim larger market shares in these products. Recently Mali was admitted into the World Trade Organization underscoring its seriousness in participating in international trade.

To be able to lobby for an increased volume of trade, create trading partners, access market information and negotiate transactions, Mali needs trained personnel. In order of priority, agribusiness ranked first on the priority list of the private sector group during the stakeholder workshop and was ranked second after biotechnology by the steering committee. Agribusiness training is particularly important for the people in the private sector whose daily activities involve buying, selling and negotiations, and extension who will be engaged in working with people in the business sector and farmers who are the producers, and the staff of IPR/IFRA who will be involved in training a new batch of Malian entrepreneurs.

Management of Natural Resources and the Environment (including forestry)

Mali is prone to great environmental hazards including drought and hydrological problems resulting from poor irrigation and the gradual push of the desert to arable

areas. High population densities in some regions in Mali are continuously putting pressure on arable land for crop production and grazing livestock. Land degradation and the unsustainable use of natural resources are limiting the potential for agricultural development in Mali and leading to a loss of important environmental services such as watershed protection and the maintenance of biodiversity.

In terms of productivity linkages to the environment, agro-environmental problems identified include soil erosion and sedimentation, urban agriculture, and pesticide contamination; irrigation related environmental problems involve water quality and quantity. Although the Ministry of the Environment has put in place a strategy for the preservation of its natural resource base and for the protection of both its rural and urban environment, it's *Direction Nationale de l'Assainissement et Contrôle de Pollution et des Nuisances* (DNACPN) which is responsible for environmental impact assessments and the *Direction Nationale de la Conservation de la Nature* (DNCN) which is charged with natural resource management lack trained personal for monitoring and evaluating an effective natural resource use policy and carrying out environmental impact assessments.

Staff of these two directorates expressed interest in undergoing long term training in this discipline while the Ministers of the Environment and Food Security made a special appeal for the training of a staff of a *Secretariat* which the government of Mali has set up as a planning and monitoring body for the management of natural resources and the environment. In addition, researchers in the agro-forestry division of IER and the staff of the forestry division of IPR/IFRA expressed interest in training by upgrading their current MS levels to PhD. When asked in the survey which of the departments is deteriorating in terms of research and manpower, 89% of respondents at IPR/IFRA ranked the forestry division as first while 70% of respondents in research ranked agro-forestry as second to livestock.

Irrigation

Irrigated agriculture is much suited to Mali's desert climate. To attain food security, Mali has the potential for irrigation that assures the production of food. During the rainy season, rice is the main crop that is irrigated while some farmers irrigate vegetables during the dry season. Irrigation technology requires efficient designs and good management skills for efficient use of water. Because the technical, managerial and social requirements for an irrigation scheme are so high, considerable expertise is needed to maximize the benefits for the cost.

Personnel of Malian institutions are not adequately qualified to face the challenges of efficiently managing new irrigation systems. Current systems mainly using gravity are becoming obsolete. The majority of staff in this field have either the 2-year university diploma or a BS while only 15% of survey respondents hold an MS degree. This demands a new set of graduates in modern irrigation systems and water shed management who could make food production possible throughout the year as Mali moves towards increasing its agricultural productivity.

Information and communication

An exciting aspect of globalization is that information is now broadly available and more affordable than ever before. Training in the information revolution is central to Mali's future role in the new global economy because it can provide access to information about new market opportunities and new technologies. Access to information technology can provide opportunities to disseminate technological information to decision makers and to farmers more cheaply and effectively and opportunities to reduce agricultural risks. Deficiency in this capacity is greatly hindering the flow of research results from the research institutes and creates a lag in marketing IER's research success. The incorporation of information technology (e.g. computers and satellite technology) in agriculture will improve the ability of Malian stakeholders' in the farm business to manage resources and to adapt more rapidly to changing conditions.

From the survey, 35% of respondents expressed having no knowledge of browsing the internet and only 12% use the internet to search for information to aid them in research. 96% of respondents ranked their institution's bulletin board or newsletter as their main source of agricultural information while 87% rely on the institutions library for information and research. Unfortunately, these libraries are heavily underfunded and lack the required reading materials. The materials that are available are outdated and may not serve the purpose of literature for publishing in good referral journals. This training in information technology and communication is not only required but a modest provision of communication equipment is a necessary long lasting solution that will be of benefit to Malian institutions engaged in agricultural research and teaching.

Geographic information systems (GIS)

Satellite and geographic information systems have great potential to help researchers and policy makers collect data and analyze spatial issues related to the production and distribution of agricultural commodities and natural resource management. Timely data on crop production, fisheries and irrigation can be gathered using GIS for efficient agricultural planning. As part of agricultural and environmental planning, the suitability of the soils for each specified crop, hydrology and other environmental factors in each region can be assessed using GIS techniques. GIS is relatively new to Malian agriculture and the laboratory at Sotuba one of the sub-stations of IER has only one qualified personnel posted by ICRISAT.

For efficient farm planning, there is need to train personnel at IER and Ministry staff engaged in management of natural resources and the environment so they could use the GIS technique in a timely and efficient manner.

Food Processing (including quality control)

The weather and environmental conditions in Mali can be erratic with seasons of good harvest when crop production is in abundance and sometimes a period of drought when hunger becomes prevalent. Mali thus needs to develop its post harvest and food processing systems in order to transform food products that could be stored for longer periods and also to be prepared for the export market. Greater trade linkages are developing among Malian suppliers and industries around the world. These links are developing in response to the need to assure a regular and diverse product supply to international markets. Food production and processing is likely to increase as the skills of farmers are enhanced with new techniques developed through research being made available to them. At present Mali is already becoming food sufficient but the amount of food wasted as seen in the market place is huge. If Mali's capacity to add value to these harvested products and convert them into long lasting storable forms is enhanced, farmers' income will increase and Mali's capacity to export will also improve.

In addition, quality control of crop and animal products are increasingly becoming important issues in the food processing and marketing chain. Mali is also laying down the foundation for seed production using biotechnology. This requires bio-safety regulations. Mali is already engaged in the process of creating a national system for biotech regulation. This process however suffers not only from a high information base but from trained personnel to direct the process. The need therefore to develop a viable training program of food processing need not be overemphasized. There are limited quality control capabilities within the country that require their skills to be upgraded. The *Direction Générale de la Réglementation et du Contrôle* is heavily understaffed with only three staff members to take up the national challenge of quality control. While in the research system only 20% of respondents indicated having the required skills in food processing. There is thus an urgent need to train staff in research and extension and the *Direction Générale de la Réglementation et du Contrôle* in food processing.

Animal Nutrition and Health

Livestock plays a key role in the economy of Mali and livestock products command a reasonable proportion of Mali's exports. However, poor seasonal characteristics of natural forage and the persistence of bacterial, viral, and parasite diseases are today major constraints to improving livestock production and productivity. To meet these challenges, Mali needs efficient and well-trained animal nutritionists and veterinarians in both the public and private sectors. As expressed in the responses to the survey, 93% of respondents ranked livestock as number one when asked to rank sectors/departments or institutions that are deteriorating in terms of human capacity and infrastructure. At present IER has just two qualified staff in this field. IPR/IFRA and DNAER have none. Training staff of these institutions would be a necessary move in the right direction towards improving Mali's agricultural sector.

Fisheries

Fishing is an important sub-sector of the Malian economy. Consecutive to the drought period, fish production declined from 100,000 tons before the drought to 80,000 tons today. However, Mali has the potential for the development of fish culture. From the survey results and the stakeholder workshop, there is presently no staff in Mali with graduate training in fishery and the curriculum at IPR/IFRA do not provide for fisheries training. However, as the fish industry is showing signs of improving, the need for training in fisheries management to catch up with this trend is recommended. Training in this domain is not yet provided by any specialized institution in Mali. Extension personnel should be the target in this direction to be able to provide the right message to fishermen, fish farmers and those engaged in the fish business.

Modes of delivery of Long Term Training

Although full time training outside of Mali has not historically had the intended impact, because the trainees are frequently lost to their intended employers either because they seek more lucrative opportunities outside government, move into more attractive opportunities in government, or are reassigned to other posts, it would be unwise to propose that training be limited to non-marketable skills. To be cost effective however and reduce the loss of trained personnel the stakeholder committee prioritized the following modes of delivery.

- ‘Sandwich’ programs involving at least a year of classes in the United States or within the region or a third country, whichever offers quality education and is cost effective, and another year of field research in Mali was the popular choice for delivery of training. Staff at IPR and most of the researchers at IER have several years of experience in field level research and have served as supervisors for graduate level theses for students in the sub-region. Moreover, the teaching and research systems have a long-standing regional collaboration with international research institutes such as WARDA, ICRISAT, IITA etc. that have the capacity and human resources for graduate student supervision. A research resettlement fund or grant is proposed in the case of PhD candidates upon their return home.
 - Participants of the stakeholder meeting emphasized their preference for the first set of students to undergo training in the U.S. This choice is supported by survey results as shown in figure 2, where 53% want at least their initial year of training to be in the U.S. while those who want full time training in the U.S. ranked third. Except in situations where an African regional institution is more cost effective, the choice of training of the first batch of Malians in the U.S. should be pursued. This is because the U.S. has the appropriate universities in all the prioritized areas coupled with a market oriented democracy which is

required by the new breed of Malian technocrats as the country moves towards a market led economic system.

- To be more cost effective, the ‘sandwich’ program could be crafted in a CRSPs (Collaborative Research Support Programs) manner, which has become a popular higher-level training delivery system with many U.S. universities. The CRSP model involves full time graduate training in the U.S. with the host university waiving tuition for the trainee. Upon graduation, provision is made for career development through collaborative research grants, post degree mentoring and two-way traffic of research findings between the U.S. and Africa. What should be emphasized in the CRSP mode is the post degree mentoring of young graduates and the availability of collaborative research grants after training.

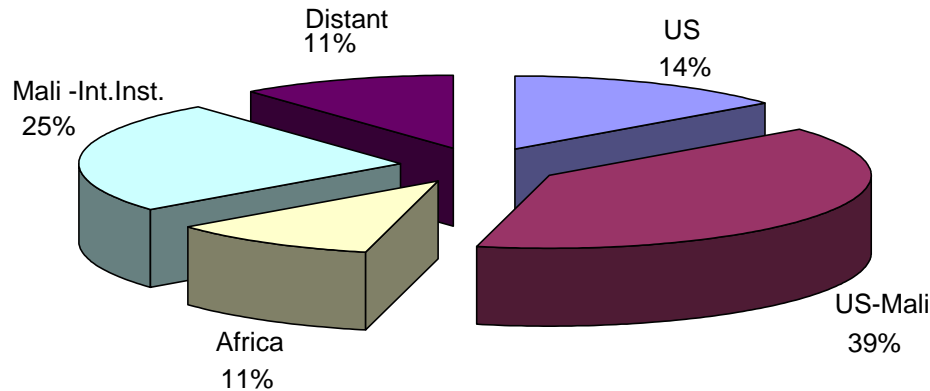


Figure 2: Training delivery preferences

Source: Survey data, 2003

- Distance education ranked with full time training in Africa as the least preferred mode of delivering training. From the survey, this choice was popular among the older professionals who prefer work and study at home to full time study abroad. Only 25% of them expressed interest in distance education while 70% of them expressed interest in short term training in Mali. Secondly, though there is growing support from the Association of African Universities to strengthen regional universities for specific fields of study, for example the African Economic Research Consortium for study of economics, such a consortium has not yet been formed in most fields in agriculture. Thus Malians will continue to seek graduate level training in the North, which makes the role of the U.S. to deliver training very important.

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- Institutional twinning: As the human and institutional capacity of IPR/IFRA develops, it is proposed that IPR/IFRA and IER (the two main institutions in teaching and research respectively) be linked with universities in the U.S. for the exchange of professors as researchers who could go over to Mali for a semester or a year, as the case may be, to teach and/or undertake research in disciplines that may be lacking at IPR and IER. Concurrently this would facilitate mentoring of the new batch of graduates in teaching and research and supervision of graduate theses and at the same time provide new direction and greater impetus into research at IER.

6. Linking the Long Term Training Priorities with USAID/Mali's strategy

In May 2002, USAID/Mali published its Country strategic plan FY 2003-2012, with five strategic objectives:

- High impact health services
- Improved quality of basic education
- Shared governance through decentralization
- Accelerated economic growth (AEG)
- Communication for development.

The proposed priority areas for long term training (LTT) could be contrasted with USAID/Mali's strategies while other areas share similar features. The proposed priority areas identified in this report are largely consistent with the accelerated economic growth (AEG) strategic objective which focuses on three interrelated intermediate results (IRs):

- Increased agricultural production
- Increased trade in selected agricultural products ,
- Increased access to financing for investment in the agricultural sector.

All the priority areas share common ground with the accelerated economic growth strategic objective in the following ways:

Biotechnology for sustainable seed production. USAID Mali recently undertook a biotechnology assessment in Mali in order to identify the most appropriate, quickest impacting application of biotechnological advances in Mali. USAID/Mali has expressed interest in the use of IEHA funds to develop biotechnological capacity in IER and the University of Mali in order to support the improvement of seed multiplication and dissemination systems. During the FY04 –FY 08 period, USAID intends to strengthen the capacity of Malian researchers to handle biotechnology and

will link up those researchers with the international biotech research community, including U.S. universities, the biotechnological industry, and the CGIAR network.

Policy analysis- is a short term biotechnology related activity. USAID/Mali intends to support training sessions in biotechnology for policy-makers, scientists and technicians.

Irrigation: USAID/ Mali intends to focus IEHA funds on the expansion of irrigation efforts which are already having quick measurable impacts for small holder incomes. In this regard initial FY03 funds have been proposed to focus on the expansion of small holder irrigation perimeter development of improved irrigation systems in various areas of southern Mali. Increased investment in public and private irrigation production systems is also planned to be encouraged and facilitated.

Natural Resource Management: Training in natural resources management including the performance of environmental impact assessments (EIA) and environmental audits (EA) will reduce the costs associated with irrigation and other industrial investments. Training that would best accelerate the improvement of the EIA and EA process would provide accelerated access to the benefits of a well-designed irrigation infrastructure and various public/private investments, e.g. a sugar factory, tannery etc. USAID/Mali intends to support training in EIA to strengthen the activities of the Ministry of the Environment and other ministries as well as the private sector engaged in natural resource management.

Increased trade in selected agricultural products: The trading enterprises and trade development agencies in Mali lack the technical and managerial capacity to analyze and lobby for policy change or to move their enterprises from the informal to the formal sector. It is planned under the USAID/Mali strategy to strengthen the business skills of private sector trading enterprises to develop value-adding processing in order to diversify exports and markets.

Increased access to financing for investment in the agricultural sector: Several issues constrain efficient production and delivery of products to market, including poor transportation infrastructure, lack of entrepreneurship, etc. Agribusiness needs in Mali are enormous and broad in scope. IEHA funds will enable Mali to strengthen and broaden the activities already planned under the 2003-2012 Country Strategic Plan. The mission plans that its agribusiness support program will cover a range of activities including diffusion of regional trade information, provision of new business opportunities; business support services related to seed production; outreach on linkages between export-led agriculture growth and poverty alleviation and technical degree training for the next generation of agro-entrepreneurs at IPR/IFRA.

USAID/ Mali plans also to support interventions most likely to enable enterprise growth, profitability and employment creation.

7. The Case for Strengthening Human and Institutional Capital

Since 1995, USAID Mali has not funded any new long term degree training. Participant training programs helped Mali afford a critical mass of well-trained scientists, economists and engineers who have had a major impact on the development of the country over the past twenty years. Many of them held higher level positions within the government and the private sector and advocated policy changes conducive to an open economy, good governance and broad-based economic growth. It is hoped that USAID/Mali would benefit from IEHA funds to reinstate the participant training program to strengthen the technical and managerial capacity of Mali. The mission hopes that all three intermediate results under the accelerated economic growth strategic objective will benefit from capacity building.

Biotechnological training will benefit USAID intervention in the production of rice, animal and horticultural products in terms of increased capacity to conduct research on varieties and design policies regarding bio-safety.

Irrigation investment is a major focus area under the 2003 -2012 strategy. Current studies indicate major constraints related to the high cost of irrigation development in Mali due to the poor design of the infrastructure and high water losses.

Another major constraint to agricultural growth in Mali is the lack of appropriate financing instruments for agriculture and bankers' lack of skills in appraising the risk related to agricultural projects.

The Mission's plan of action is thus compliant with training needs expressed by Malians themselves and documented here. Mali's lack of skilled personnel has been clearly spelled out in this needs assessment report and the need for USAID to bring back long term training into its portfolio to help produce the next batch of Malian professionals in agriculture cannot be overemphasized.

Sustainability of Long Term Training

IPR/IFRA is the only agricultural university in Mali. It provides training for the majority of the Malian working class and some countries in the West African sub-region. It currently has 25% of its enrollment in international students coming mainly from francophone countries in West Africa. Currently, the teaching and research institutions in Mali lack the required staff to offer quality graduate level training in the disciplines identified in this report. This therefore requires a process of training of trainers. Staff of the institutions could be trained in U.S. universities or renowned regional universities at the graduate level to be able to teach and carry out research upon their return to Mali and later could introduce graduate level training at IPR/IFRA. USAID should be resolute not only in training staff of this university but

in supporting any twinning arrangements between the university and any other institutions in the U.S. or the region.

One major reason why returns from former training programs funded by USAID in Mali were not sustainable is that no plans were put in place for replacement of those trained when they reached the age of retirement or to be able to transfer their knowledge to a new cadre of Malians. For sustainability of future training programs it is necessary for USAID to support the training of faculty at IPR/IFRA and the researchers at IER and to gradually upgrade IPR/IFRA to a level that it could offer graduate level training in the near future.

Doing so will rapidly increase the nations technical and scientific capacity by having the capacity to train Malians from technician diploma level to PhD. Moreover, it will increase the retention of advanced trained graduates to contribute to nation building. Since external funding always has a time limit, upgrading the university and research institution with well-trained staff would provide a cushion for the continuous provision of national training needs when external funding discontinues. Similar models have been employed elsewhere in the region, for instance the Wonde Genet College in Ethiopia, the Hassan II University in Morocco, etc. Mali is currently undergoing reforms at national and institutional levels. It is believed that these reforms will provide sufficient foundation for future running and maintenance of its university and research institutions.

8. Local and Regional Training Programs that Could be Used for Some of the Priority Areas

Through twinning or partnership arrangements between US universities and universities in Africa on the one hand and European universities and universities in Africa on the other, the capacity of a couple of universities have been greatly enhanced to provide graduates in specialized fields of agriculture. Examples of such institutions include Hassan II University in Morocco, Egerton University in Kenya, Wondo Genet College of Forestry and Debub University in Ethiopia and the Faculty of Forestry at the Sokoine University in Tanzania (BIFAD, 2003). Recently, the Ford and Rockefeller foundations have added to this course by supporting the upgrading of existing universities to be able to undertake research in recent advances in biotechnology and trade.

There are several organizations promoting research and capacity building through collaborative actions between African institutions and institutions in the north including foundations. The general aim is to increase the access of African institutions to essential data bases, to utilize the emerging informational technologies to strengthen the community of scholars concerned with African development, provide training opportunities and support to physical infrastructure. The following are the most active organizations:

African Economic Research Consortium's (AERC)

AERC's training program which was set up in 1988 to support PhD thesis research has rapidly broadened to support graduate training in economics, as well as improve the capacities of departments of economics in local public universities in the region. These include three collaborative sub-regional Master's programs:

- The Collaborative Master's Program (CMAP) for Anglophone Africa (outside of Nigeria), which is executed by the AERC;
- The Francophone Africa programme executed by Conference des Institutions d'Enseignement et de Recherche Economiques et de Gestion en Afrique (CIEREA); and
- The Nigerian program, which is executed by the Foundation for Economics Education (FEE).

The AERC spearheads and provides for cross-program interactions of the above program. Also in place is a staff development program through which PhD fellows are offered courses geared towards strengthening the teaching capacity at participating universities. The aim is to develop economics programs in Africa that meet international standards, are relevant to African needs and can eventually be sustained from local resources. The typical master's degree program takes 18-24 months. The AERC also offers a limited number of fellowships annually to African nationals intending to pursue a career in economic management, research and/or teaching at a public institution in Sub-Saharan Africa. Participating universities in both MA and PhD programs comprise those, which are deemed to have adequate capacity to offer core courses (Macroeconomics, Microeconomics and Quantitative Methods) and meet jointly determined and enforced standards. Currently these are: the University of Ghana, Legon; University of Addis Ababa, Ethiopia; University of Nairobi, Kenya; University of Dar es Salaam, Tanzania; University of Malawi; University of Zimbabwe; and the University of Botswana. AERC could be used for the identified training needs in trade and agribusiness.

AERC's success is proposed to be replicated by the Rockefeller Foundation in Southern and East Africa if funding can be secured (Oluoch-Kosura and Fine 2003). Its focus will be an M.Sc degree program in agricultural and applied economics.

African Education Research Network (AERN)

AERN is a network of universities in Africa, the UK, Canada, and the US, which aims to strengthen the capacity of universities in Africa. Current members of the AERN include North Carolina State University, Ohio, University, Clark Atlanta University, Makerere University, The University of Namibia, The University of Zimbabwe, Kenyatta University, The University of Manchester, the National University of Lesotho and Bayero University in Kano, Nigeria.

African Virtual University (AVU)

AVU was conceived using the expertise and facilities of the World Bank with the support of Vice Chancellors from various African universities. It has progressed into establishing learning centers at partner universities in 17 African countries (9 anglophone, 7 francophone, and 1 lusophone), that offer training in Journalism, Business studies, Computer Science, Languages, Accounting, etc. It is experimenting with distance education by sending lectures from professors in the U.S. and Europe to African universities via satellite.

Association for the Development of Education in Africa (Paris)

The Association for the Development of Education in Africa focuses on developing partnerships between Ministers of Education and funding agencies in order to promote effective education policies based on African leadership and ownership.

Association of African Universities (AAU)

AAU is an international non-governmental organization set up by universities in Africa to promote cooperation among themselves and between them and the international academic community. Some of its objectives include the collection, classification and dissemination of information on higher education and research, particularly in Africa; promoting cooperation among African institutions in curriculum development, and in the determination of equivalence of degrees; organizing and supporting seminars and conferences between African university teachers, administrators and others dealing with problems of higher education in Africa.

West African Biodiversity and Law Initiative (WABILNET)

WABILNET is a recently established network resulting from a training course on 'The Biodiversity, Biotechnology, and Law Training for West Africa' organized by the Global Biodiversity Institute (GBDI) in association with the International Institute for Tropical Agriculture (IITA), held at the IITA facility in Ibadan, Nigeria, from March 1-24, 2000. The training course for West Africa was the second in a series that started in East Africa in 1999. The network aims to elucidate a regional approach to key policy issues relating to biodiversity and biotechnology; to advise regional policy makers on these critical policy issues, to serve as an information clearinghouse, and to organize follow-up activities as appropriate. The American Association for the Advancement of Science (AAAS) Africa Program is associated with WABILNET and GBDI to organize follow-up workshops with high-level regional policymakers.

Within the region the following universities are offering training in biotechnology and biodiversity: University of Dar es Salaam in Tanzania, Makerere University in Uganda, Addis Ababa University in Ethiopia, the University of Nairobi in Kenya, University of the Western Cape in Republic of South Africa and the University of the Witwatersrand in Johannesburg, Republic of South Africa.

Training in most of the other priority areas can be provided in several universities within the region.

Consultative Group on International Agricultural Research (CGIAR)

CGIARs particularly those based in Africa have long provided collaborative facilities and funded graduate level research in Africa. Most of the staff at these CGIARs serve as members of research committees for graduate level research, have supervised graduate students' research and contributed to publishing research results in renowned journals. If the 'sandwich' program which ranks high among the modes of training delivery in this report is adopted, the facilities of the CGIARs based in the region could be used for the research component of graduate training. Regional CGIARs include West Africa Rice Development Association (WARDA), now based in Mali, International Institute of Tropical Agriculture (IITA) in Nigeria, World Agroforestry Centre (ICRAF) in Kenya, International Livestock Research Institute (ILRI) in Kenya and Ethiopia. Other CGIARs also operate in the region with either sub offices or through a desk officer.

For all of the long term training needs proposed there is no available strong graduate program in Mali. The College of Agriculture currently offers only technician and bachelor's level training. For some of the training needs proposed, regionally renowned graduate programs could be found in universities within the region which may be much more cost effective.

Short Term Training Areas of Priority

Table 23 presents disciplines for which Malians would require short-term training. From the survey, short-term training was more popular among people older than 45 years. This is understandable because short-term training, in most situations, is less demanding in time and commitment. The programs are most often delivered in-country, or in neighboring countries based on availability of expertise and cost. Short term customized training programs range in length from two weeks to six months, and may involve a single recipient group or several groups totaling, in some cases, hundreds of trainees.

Though almost all the short term training proposed in table 23 was popular amongst the stakeholder workshop participants and respondents to the survey, English as a Second Language was requested by all parties, even by ministers and heads of institutions. In Mali, English as a medium of communication is gaining momentum as the country's economy becomes more privatized, thus exposing it to external competition, where trade partners use English as medium of communication. Moreover, for personnel in teaching and research, it is increasingly being realized that faster progress can be made in their disciplines if they can read and write in English since most good journal articles and textbooks are written in English.

A training institute in Mali called PRODESCO, established with support from USAID, has been in operation for over 20 years and administers most of the U.S. higher education entrance exams including the TOEFL, the GRE, and the GMAT. Such a training institution, which has gained huge understanding of the U.S. education system, can be used to deliver short-term training for Malians in high offices and to prepare candidates selected for LTT in U.S. or an English speaking country.

Table 22: Long Term Training Needs per Institution, Discipline and Type of Degree

	Ministries of Agriculture, Livestock, Fishery/Food Security						Ministry of Environment				Ministry of National Education						Grand Total
	IER		DNAMR/ DNAER		DGRC		DNCN		Secretariat Permanent		IPR/IFRA		Private sector		Degree Totals		
Institutes →			MS	PhD							MS	PhD					
Discipline ↴	MS	PhD	MS	PhD	MS	PhD	MS	PhD	MS	PhD	MS	PhD	MS	PhD	MS	PhD	
Biotechnology	6	15	0	0	0	0	0	0	0	0	0	7	0	0	6	22	28
Mgt of Natural Resources & Environment	0	3	8	0	0	0	6	2	2	0	0	2	3	0	19	7	26
Geographic information System (GIS)	1	0	3	1	0	0	10	0	3	0	1	2	0	0	18	3	21
Food Processing	0	2	4	0	0	0	0	0	0	0	0	4	11	0	15	6	21
Fish Culture	0	0	20	0	0	0	0	0	0	0	0	0	0	0	20	0	20
Conservation of Agricultural Products	0	0	10	0	0	0	0	0	0	0	0	0	5	0	15	0	15
Fish Transformation and Conservation	0	0	15	0	0	0	0	0	0	0	0	0	0	0	15	0	15
Epidemiology	0	0	0	0	10	5	0	0	0	0	0	0	0	0	10	5	15
Agronomy	5	4	1	0	0	0	0	0	0	0	0	2	2	0	8	6	14
Biometrics	0	3	2	0	0	0	0	3	0	0	2	3	0	0	4	9	13
Information Technology	1	0	4	0	0	0	3	1	0	0	3	0	0	0	11	1	12
Health Legislation	0	0	0	0	8	4	0	0	0	0	0	0	0	0	8	4	12
Agricultural Economics (Incl. Agribusiness + Trade)	1	4	3	0	0	0	4	1	0	1	1	3	2	0	11	9	20
Irrigation Technology	0	5	5	0	0	0	0	0	0	0	0	1	0	0	5	6	11
Market information Systems	0	0	0	0	0	0		0	0		0	0	10	0	10	0	10
Extension, Animation Communication	0	0	0	0	0	0	8	0	2	0	0	0	0	0	10	0	10
Hygiene of food products	0	0	0	0	7	3	0	0	0	0	0	0	0	0	7	3	10
Ecological Studies (Biodiversity)	1	3	0	0	0	0	0	0	0	0	1	5	0	0	2	8	10
Ag. Extension Communication	0	0	9	0	0	0	0	0	0	0	0	0	0	0	9	0	9
Policy analysis	1	1	3	0	0	0	0	0	0	0	1	2	0	0	5	3	8
Animal Nutrition	1	2	1	0	0	0	0	0	0	0	1	2	0	0	3	4	7
Community Development	0	0	6	0	0	0	0	0	0	0	0	0	0	0	6	0	6

Integrated rural development	0	0	6	0	0	0	0	0	0	0	0	0	0	0	6	0	6
Aquatic Fauna	0	0	4	2	0	0	0	0	0	0	0	0	0	0	4	2	6
Horticulture (Seed Production)	0	0	2	0	0	0	0	0	0	0	0	0	3	0	5	0	5
Quality Control (Food Products)	0	0	0	0	4	0	0	0	0	0	0	0	0	0	4	0	4
Environnemental Impact Analyses	0	0	0	0	0	0	3		0		0	0	0	0	3	0	3
Project Monitoring and Evaluation	0	0	3	0	0	0			0	0	0	0	0	0	3	0	3
Negotiation Capability	0	0	3	0	0	0		0	0	0	0	0	0	0	3	0	3
Bioengineering	1	0	2	0	0	0	0	0	0	0	0	0	0	0	3	0	3
Economic Analysis/Econometrics	0	0	0	0	0	0	2	0	0	1	0	0	0	0	2	1	3
Human Resource Management	0	0	2	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Defence and Soil Restoration	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2	2
Library Sciences	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Totals															253	101	354

Table 23: Short Term Training Needs per Institution and per Discipline

Discipline	Institutions				Totals
	IPR/IFRA	IER	DNAMR	Private Sector	
English	166	50			216
Management of Information System	307	200	250	10	567
Project Management	100	2	50	10	162
Biometrics	113		15		128
Technical Writing	82	60	10	20	172
Biotechnology	2	2	20	7	31
Biodiversity	95	15	30		140
Agro Forestry	75	30	50		155
Extension	10	2	50	2	64
GIS	10		50	1	61
Irrigation Systems Management			40		40
Animal Disease Diagnostics				10	10

9. Projections for Phasing Out the Proposed Long Term Training

Table 24 provides projections for phasing out of the proposed long-term training program in Mali. It is assumed here that training of Malians will take place in the U.S. until human and institutional capacity of the college of agriculture (IPR) is improved to a satisfactory level to be able to deliver graduate level training. The total figures used are based on estimates provided by institutions in Mali, given in table 22. Location of training in Mali suggests PhD students returning home in their final year of study to carry out thesis research.

Table 24: Mali Long Term Training Phase out plan

Year	No. Per level to be trained		Location of Training	of	Total in Training	Projected Cumulative Graduates	
	MS	PhD				MS	PhD
01	28	11	39	0	39	0	0
02	25	10	74	0	74	0	0
03	25	10	70	11	81	28	0
04	25	10	70	10	80	53	11
05	25	10	70	10	80	78	21
06	25	10	70	10	80	103	31
07	25	10	70	10	80	128	41
08	25	10	70	10	80	153	51
09	25	10	70	10	80	178	61
10	25	10	70	10	80	203	71
11			35	10	45	228	81
12				10	10	253	91
							101
Total	253	101					

In table 25, projections are made on the cost of LTT in the U.S. based on average tuition and board in public PhD granting universities. Costs in this table are conservative, considering only cost for PhD training, using the total number of trainees. Note also that the cost associated with research is not included in these projections noting that such costs are highly variable and based on scope of research and type of discipline. The table however provides a picture of how much LTT will cost in the U.S. spanning over approximately a decade. Comparative analysis of costs is not provided here since preference for initial training in the U.S. as a means of delivering LTT has been expressed in this report and the significance of such preference underscored.

Table 25: Cost Associated with the Long Term Training Phase Out Plan

Year	No. of Trainees	Total Cost Based on	
		Resident Tuition and Fees	Non Resident Tuition and Fees
01	39	\$223,509	\$554,826
02	74	\$436,817	\$1,084,329
03	70	\$425,601	\$1,056,488
04	70	\$438,369	\$1,088,182
05	70	\$451,520	\$1,120,828
06	70	\$465,066	\$1,154,453
07	70	\$479,018	\$1,189,086
08	70	\$493,388	\$1,224,759
09	70	\$508,190	\$1,261,502
10	70	\$523,436	\$1,299,347
11	35	\$269,569	\$669,164
Total		\$4,714,485	\$11,702,962

Notes:

- Year 01 tuition and fees and board on average of public doctoral granting institutions (as reported by NASULGC – National Association of State Universities and Land-Grant Colleges) for 2003 plus 10%.
- In subsequent years tuition and fees are increased by 3% per year to cushion anticipated increases in fees.

Appendices

Appendix 1: Questionnaire

Needs Assessment for Training and Capacity Building in the Agricultural Sector of Mali

AED is collaborating with USAID to identify long-term training and capacity building interventions needed to assist with the development of the agricultural sector in Mali. You were selected to complete this questionnaire based on your position in this institution. The questionnaire takes about 20 minutes to complete. If a question does not apply, please write N/A. We would also like to assure you that the information you give will be kept confidential and will be combined with other responses for reporting.

1. Please indicate your:
Name _____ Age _____
Gender: ___Male ___Female
2. What is your highest qualification? _____
Diploma _____ Year _____
Field _____

How many years have you worked in your field of specialization (work experience)?
___2 years ___3-5 years ___5-10 years ___10-15 years ___More than 15 years
3. What field of specialization best describes your current position?

4. Please indicate the department in which you currently work

5. What is your current position in this institution?

-
6. How long have you been in your current position?
 ___>2 years ___3-5 years ___5-10 years ___10-15 years ___More than 15 years
7. How many research projects have you participated in during the past 5 years?
 ___1 year ___2-3 years ___4-5 years ___Over 5 years
8. How many research projects have you initiated in the past 5 years?
 ___None ___1 ___2-3 ___4-5 ___More than 5
9. How many have been completed?
 ___None ___1 ___2-3 ___4-5 ___More than 5
10. List two major ongoing projects (research, extension activity, education project) that you are currently implementing and /or participating in?
- 1). _____

- 2). _____

11. List the number of people involved in the projects in 10, along with their disciplines, levels of specialization (BSc, MSc, PhD), and time allocated in doing it. Please start with yourself.

Research/Project No. 1

Person	Diploma	Field of Specialization	Department	% time
<i>Example</i>	<i>PhD</i>	<i>Agronomy</i>	<i>Agronomy</i>	<i>35</i>
1				
2				
3				
4				

Research /Project No. 2

Person	Diploma	Field of specialization	Department	% Time
1				
2				
3				
4				

12. Do you get support from other staff members when you need to accomplish your research project?

__All the time __Most times __Sometimes __Not at all

If not at all, why?

13. Are all subject areas that can help you carryout your work available in your institute?

__Yes __No

14. If no, list the disciplines that you think are needed that are not available in your institute.

a) _____ c) _____
b) _____ d) _____

15. List research projects being implemented in the institute or in the country or internationally that you are associated with, stating amount of time allocated to each.

Title	Duration	Institute & Location	% Time

16. What is the trend in the number of research/projects being pursued over the past couple of years in your department?(move for heads)

__Declining __Constant __Increasing

If declining, why?

17. Please indicate any training you have had in the past 15 years

Title	Level	Year	Location
<i>Example: Crop Protection</i>	<i>Certificate</i>	<i>June1980-Sept1980</i>	<i>IPR/IFRA, Mali</i>

18. Which type of training will you be interested in?

- 1). Short term
- ___ Less than one month
- ___ More than one month but less than 6 months
- ___ More than 6 months but less than one year
- 2). Long term (at least 1 year degree)
- Please prioritize on a 1-3 scale with 1 being the highest priority
- ___ Full time in Mali
- ___ Part time in Mali and Part time in an another African institution
- ___ Full time in another African institution
- ___ Part time in Mali and Part time in Europe/America or Asia
- ___ Full time in Europe or America or Asia
- ___ Full time in Mali but in partnership with an international institution
- ___ Distance education (internet based)

19. Please prioritize areas in which you would like to receive training.

Field of specialization	Level			
	Certificate	BS	MS	PhD

20. How many people do you think will be interested in training or interested in your choice of training in your department/institution?

___1 ___2 ___3 ___4 ___5 ___Above 5

21. In your opinion which three fields of study are most lacking in this institution?

1. _____
2. _____
3. _____

22. Among the departments in this institute, which one do you think has positively changed in:

Human resources: _____

Infrastructure: _____

23. Which one has not changed or has deteriorated?

Human resources: _____

Infrastructure: _____

Information and Communication

24. Please indicate your access to computers. Check all that apply.

- ☐ Have my own personal computer
- ☐ Have one assigned to me in my office
- ☐ there are a few in a room for departmental access
- ☐ there are some in a room for general access
- ☐ Have no access, I give work to the computer specialists to do the analysis and produce the document.
- ☐ I do not know how to use computers.

25. Please indicate your access to the internet:

- ☐ My personal computer has internet access
- ☐ The computer in my office has internet access
- ☐ I use the computers in a room for departmental use that have internet access
- ☐ I use the computers in a general room that have internet access
- ☐ I know how to browse the internet but do not have access to it in this institute
- ☐ I do not know how to browse the internet

26. How often do you access the internet?

- ☐ Every day ☐ Few times in a week ☐ Once a week
- ☐ Once a month ☐ Never

27. How long does it take you to get to the nearest telephone?

- ☐ Telephone is in my office ☐ Telephone is in the departmental bay
- ☐ Less than 5 minutes ☐ 5-10 minutes ☐ More than 10 minutes

28. Do you have a telephone in your office? ☐ Yes ☐ No

29. If you have a phone in your office does it receive a direct outside call?

- ☐ Yes ☐ No

30. If you do not have a phone in your office do you have access to a phone anytime you want to make a call? ☐ Yes ☐ No

31. What are your three most important sources of information about agricultural development in Mali? (Prioritize on a scale of 1-3)

- | | |
|--|--|
| <input type="checkbox"/> Institute's bulletin board | <input type="checkbox"/> National newspaper |
| <input type="checkbox"/> Institute's newsletter | <input type="checkbox"/> Television |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Business or work associates |
| <input type="checkbox"/> Groups or associations | <input type="checkbox"/> An agent of the government |
| <input type="checkbox"/> Institutions top management | <input type="checkbox"/> Internet |
| <input type="checkbox"/> NGOs | <input type="checkbox"/> Town Library |
| <input type="checkbox"/> Institute's library | |

32. What is your opinion about availability and access to research information in this institute in the recent 5 years?

- ☐ Improved ☐ Deteriorated ☐ Stayed about the same

33. Do you share information with other researchers nationally or internationally?

Networking/Coordination (Management)

34. How often does management interact with staff?

- ☐ Never ☐ Occasionally ☐ Frequently

35. When there is a departmental decision to be made, do you contribute?

- ☐ Never ☐ Occasionally ☐ Frequently

If occasionally or frequently, how?

- ☐ Through meetings ☐ Informal discussions ☐ Email

If no, do you have the right to complain? ☐ Yes ☐ No

If yes, are the complaints addressed? ☐ Yes ☐ No

If no, why _____

36. Does your department collaborate with other departments or institutions?

- ☐ No ☐ Yes, occasionally ☐ Yes, frequently

37. Which is the most important source of funding to your department? (Prioritize on 1-5 scale).

- ☐ Government budget allocation to the institute ☐ Donations

-
- ☐ Private sector (NGOs, Businesses etc) ☐ Project funds
- ☐ Product marketing ☐ Consultancy
- ☐ Others (specify) _____

38. Please prioritize the sources of technical assistance to your department? (Use a 1-5 scale)

- ☐ National University or Research Institution
- ☐ Regional University or Research Institution
- ☐ European University or Agricultural Institution
- ☐ United States University or Agricultural Institutions
- ☐ Other International Universities or Agricultural Institutions
- Others (specify) _____

Work environment

39. What motivates you to work better? (Please prioritize 1-5 with 1 being highest)

- ☐ Salary ☐ Allowances
- ☐ qualified assistant ☐ well equipped laboratory
- ☐ assurance of future research project ☐ promotion based on performance
- ☐ well equipped office (computer + phone) ☐ availability of office materials
- ☐ availability of transportation ☐ adequate reading material
- Others (specify) _____

Thank you for your time in filling out this questionnaire.

Appendix 2: Institutions visited and persons the team interviewed.

NAME	TITLE	ORGANIZATION
Seydou Traore	Ministre	Ministère de l'Agriculture, de l'Elevage et de la Pêche
Nankoman Traore	Ministre	Ministère de l'Environnement
Mohamed Lamine Traore	Ministre	Ministère de l'Education
Oumar Ibrahim Toure	Ministre	Ministère Délégué de la Sécurité
Rolf R. Anderson	Team Leader	Regional Food Security NRM & Environment Team. USAID/MALI
Yacouba Samake	Vétérinaire Ingénieur de l'Elevage	Not Given
Abdoulaye Toure	Coordinateur	MAEP
Youssouf Cisse	Agricultural Economist/Researcher	Subsector Analysis Program/IER
Mr. Sangare	Comptable	DRF/IER
Diarriso Niamoye Yaro	Coordinatrice Scientifique des Cultures Irriguées	IER
Moctar Traore	Chef de Programme ECOFIL P.I.	IER
Diarra Assa Kante	Responsable du Service Formation	IER
Aly Kouriba	Coordinateur Scientifique des Productions Animales	IER
Dembele A. Réjane	Coordinatrice Scientifique transfert de Technologie/Genre	IER
Yacouba Coulibaly	Chef Bureau Documentation, Information, Informatique et Publication	BDIP
Mamourou Dioutre	Chercheur Programme Sorgho	IER/CRRA – SOTUBA
N'Tji Coulibaly	Chercheur Programme Maïs	IER/CRRA - SOTUBA
Bamoye Diara	Chef LNA	IER/CRRA - SOTUBA
Kadiatou Toure Gamby	Chef Programme Fruits et Légumes	IER/CRRA - SOTUBA
Saïdou Ouattara	Chercheur Programme Ressources Forestières	IER/CRRA - SOTUBA
Hamidou Koumare	Ingénieur Chimiste	IER/CRRA - SOTUBA
Doré Guindo	Directeur	IER/CRRA - SOTUBA
Ntji Coulibaly	Prudue	IOWA State
Mamourou Diourté	Consultant	University of Texas

Doré Guindo	Consultant	Kansas State University
Hassane Daou	Consultant	Arkansas State University
Modibo Diallo	Anthropoqe Chef de DER	Arkansas State University
Mamadou D. Doumbia	Not Given	Arkansas State University
Aboubacar Touré	Not Given	TAMU
Adama Coulibaly	Not Given	TAMU
Lamine Traoré	Not Given	Kansas State University
Mamadou D. Coulibaly	Not Given	Texas AVN
Abou Berthé	Not Given	University of New Mexico
Oumar Doumbia	Not Given	Washington State University
Salimata Sidibé	Not Given	University of Florida
Mohamed Diarra	Not Given	Michigan State University
Amadou Sidibé	Not Given	Not Given
Pr Issaka Bagayogo	Not Given	Djom Consulting
Amadou Sidibé	Not Given	USAID
Hamadoun Dao	Not Given	UFRA
Abdoulaye Makan Toure	Not Given	ON Ségou
Aly Kouriba	Not Given	DNACPN Bamako
Mamadou D. Coulibaly	Not Given	DNACPN Bamako
Assa Kante Diarra	Not Given	IER Bamako
Alhousseïni Bretaubeau	Not Given	IER Sotuba
Aly Yéro Maiga	Not Given	IER Bamako
Mamadou Niang	Not Given	IPR Katibougou
Tahirou Coulibaly	Not Given	CNRST Bamako
Siaka Dembele	Not Given	IER Bamako
Bakary Cisse	Not Given	Rectorat Université
Pe Issaka Bagayogo	Not Given	ISFRA
Adama Traore	Not Given	CMDT
Souleymane Camara	Not Given	DGNC
Hamadoun Maradou	Not Given	DNAMAR /DF
Djibril Keita	Not Given	DNAER
Sékou Cisse	Not Given	OHVN
Djibril Sangare	Not Given	DNAMAR/DF
Mme Thiam Foufa Diallo	Not Given	ISFRA
Fassé Samake	Not Given	FAST
Soumaïla Berthe	Not Given	DNACPN
Sékou Oumar Tall	Président	APCAM
Tidiani Diara	Secrétaire Général Adjoint	APCAM
Doumbia Hawa Dolo	Conseiller Technique	APCAM

Moctar Diara	Président	CPMK Kabalaboye
Mamadou Dabo	Secrétaire à l'Organisation	SYPAMA
Souleymane Keita	SPCK	Not Given

Appendix 3: Participants in the Stakeholder Meeting.

NAME	TITLE	ORGANIZATION
Moussa Coulibaly	Chef Unité Vaccins Bactériens	Laboratoire Central Vétérinaire
Alhousseini Bretaudeau	Professeur	IPR/IFRA Katibougou
Siaka Dembele	Coordinateur Scientifique	IER
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